UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT

UNCTAD

Blue BioTrade:

Harnessing Marine Trade to Support Ecological Sustainability and Economic Equity

UNITED NATIONS

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This publication has not been formally edited.

UNCTAD/DITC/TED/2018/11

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Acknowledgements

This publication was produced by UNCTAD and the **development bank of Latin America (CAF)** through a team of international experts including Paolo Bifani, former Senior Officer at the United Nations Environmental Programme; Tundi Agardy, Founder/Director of the MARES Program, Forest Trends; David Vivas Eugui, Legal Officer, Lorena Jaramillo, Economic Affairs Officer for the Trade, Environment, Climate Change and Sustainable Development branch of the United Nations Conference on Trade and Development (UNCTAD); René Gómez-García, Senior Executive /Green Business Unit Head, and Federico Vignati, Principal Executive at CAF.

The team would like to thank peer reviewers Daniel Kachelriess, Marine Species Officer at the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Secretariat; Alain Deidun, Director at the International Ocean Institute’s Malta Centre and Associate Professor at the University of Malta; Ann Wilkings, UNCTAD BioTrade and International Institute for Sustainable Development (IISD) Consultant for their detailed comments and useful feedback and Sean Lothrop for his valuable contributions as editor.

Desktop formatting was done by Mr Rafe Dent of UNCTAD.

25 September 2018

Abbreviations

ABSCH	Access and Benefit-Sharing Clearinghouse of the CBD Secretariat
CAF	development bank of Latin America
CAST	Caribbean Alliance for Sustainable Tourism
CBD	Convention on Biological Diversity
CBF	Caribbean Biodiversity Fund
CCI	Caribbean Challenge Initiative
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CTO	Caribbean Tourism Organization
DDR	Due diligence requirement
EEZ	Exclusive economic zone
FAO	Food and Agricultural Organization of the United Nations
GDP	Gross domestic product
ILO	International Labour Organization
IOC	Intergovernmental Oceanographic Commission
ILO	International Labour Organisation
IP	intellectual property
ISA	International Seabed Authority
ISEAL	International Social and Environmental Labelling Alliance
IUU	Illegal, Unreported, and Unregulated Fisheries
MIF	Multilateral Investment Fund
MEIF	Marine Enterprise Investment Fund
MMAs	Marine managed areas
MPAs	Marine protected areas
MSP	Marine spatial planning
MSY	Maximum sustainable yield
NAMA	Nationally appropriate mitigation action
NGO	Non-governmental organization
NPAA	Natural Protected Areas Authority
NTOs	National tourism organizations
OECD	Organisation for Economic Co-operation and Development
SDG	Sustainable Development Goal
SIDS	Small island developing states
SME	Small and medium sized enterprise
TBT	Technical barriers to trade
UEBT	Union for Ethical BioTrade
UNCLOS	United Nations Convention on Law of the Sea
UNCTAD	United Nations Conference on Trade and Development
UNDESA	United Nations Department of Economic and Social Affairs
UNDOALOS	United Nations Division on Ocean Affairs
UNEP	United Nations Environment Program
UNESCO	United Nations Environmental, Scientific, and Cultural Organization
UNWTO	United Nations World Tourism Organisation
WMO	World Maritime Organization
WTO	World Trade Organization

EXECUTIVE SUMMARY

The United Nations Conference on Trade and Development (UNCTAD) defines BioTrade as "the activities of collection/production, transformation and commercialization of goods and services derived from native biodiversity under criteria of environmental, social and economic sustainability." As it directly impacts the sustainability of natural-resource exploitation, BioTrade has important implications for the objectives of the Convention on Biological Diversity. BioTrade encompasses an expanding range of goods and services, including personal care, natural pharmaceuticals, and phytopharma, nature-based fashion, horticulture products, handicrafts, textiles, sustainable nature-based tourism, and forestry-based carbon credit generation. In 2015, total BioTrade sales were estimated at €4.3 billion, and over 5 million people directly benefitted from global BioTrade.

In this context, the emerging concept of "Blue BioTrade"—focused on marine-based products and services—presents an exciting new tool to promote sustainability and equity. Blue BioTrade reflects the same seven criteria that define BioTrade: conservation of biodiversity, sustainable use of biodiversity, equitable benefit sharing, socioeconomic sustainability, legal compliance, respect for stakeholders' rights, and clearly defined tenure and access to resources. The Blue BioTrade approach involves working across multiple levels of the value chain to develop sustainable livelihoods, adopt an ecosystem-based management approach, and foster swift adaptation to dynamics markets and changing ecological conditions.

Because terrestrial products differ from marine products in important ways, the principles that define BioTrade must be adapted to the marine and coastal context. The unique socio-political characteristics of marine ecosystems require both the conservation of common-pool resources and the adoption of innovative systems to allocate property rights. The status of the world's oceans as a global commons governed by international laws and conventions (e.g., the United Nations Convention on the Law of the Sea) creates unique challenges for the sustainable exploitation of, and trade in, marine resources.[1]

Among the greatest threat to the oceans economy is the general lack of knowledge or accountability regarding the value of goods and services originating from the sea. Tracking the impact of economic activities based on indicators of marine and coastal biodiversity is challenging, as the available data on the status and exploitation of marine biota are deeply inadequate. Whereas numerous data sources are available for the terrestrial environment, marine and coastal data come primarily from the official statistics reported by the world's fisheries. Value chains for marine and coastal products tend to be relatively opaque, due in part to the difficulty and cost of monitoring these value chains, which frequently encompass multiple jurisdictions with different levels of oversight capacity. As a result, goods sourced from a particular origin are often hard to trace.

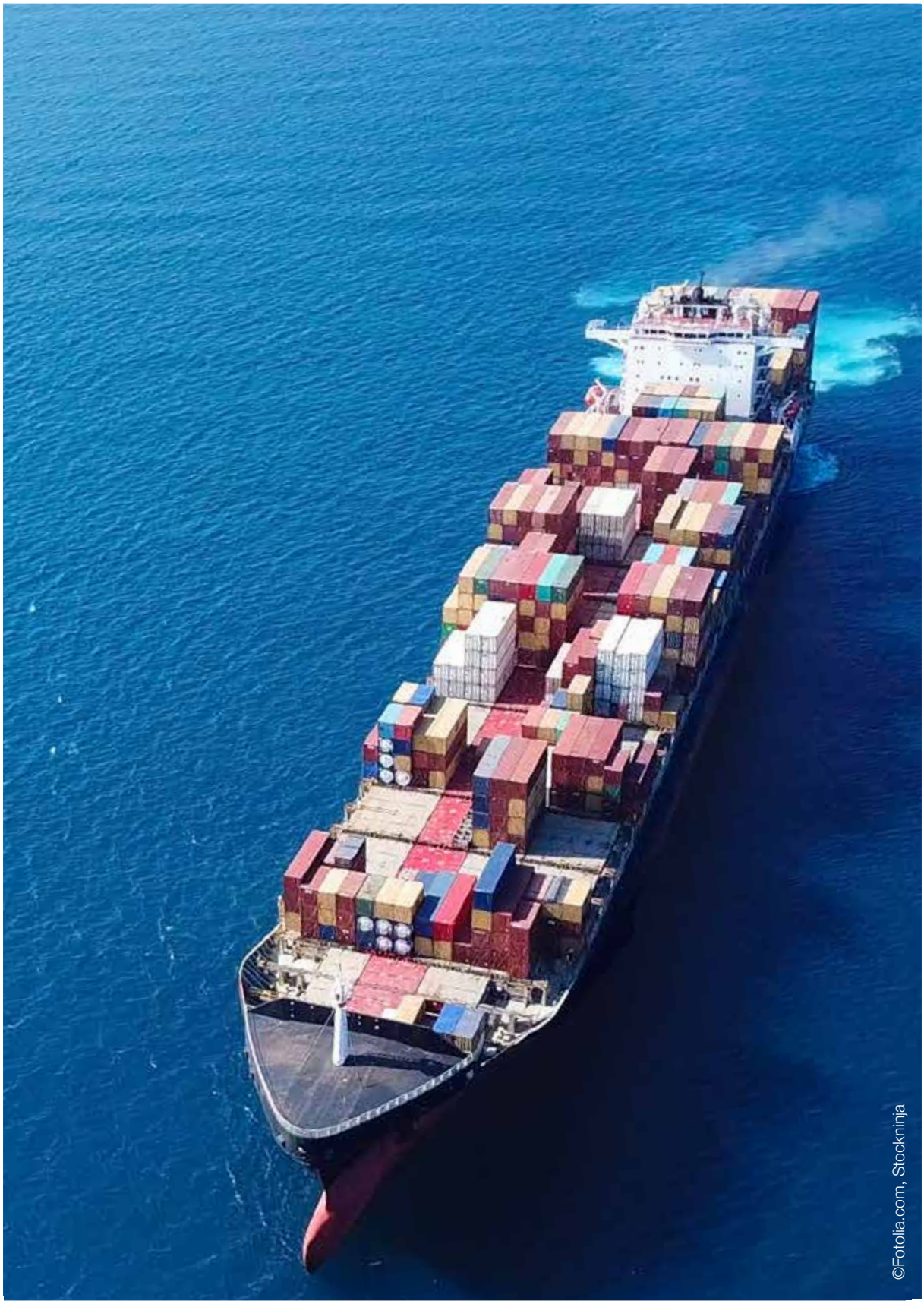
The concept of Blue BioTrade comprises a sustainable-sourcing model that is primarily applied on a business to business basis, but business-to-consumer applications have also proven successful. Like BioTrade overall, Blue BioTrade can build on international mandates and agreements, such as Sustainable Development Goal 14, the Millennium Ecosystem Assessment, UNCTAD's Nairobi Maafikiano, and other United Nations agreements and declarations. Informed by more than 20 years of experience in developing sustainable value chains and sectors, the BioTrade concept has been successfully applied to many biodiversity-based sectors, both though government policies and private initiatives. The emerging field of Blue BioTrade will catalyse the sustainable and equitable use and protection of marine and coastal biodiversity and oceans as a whole.

The following report describes how the application of the Blue BioTrade concept can promote sustainable and equitable economic sectors and value chains that rely on marine and coastal resources. A proposal for implementing a Blue BioTrade approach is described in Annex I. Blue BioTrade principles and criteria can be applied without the force of law through voluntary verification and certification systems that enable firms to obtain a price premium for embracing equity and sustainability. Once an international consensus

on the principles and criteria for Blue BioTrade has been established, and certification systems are in place (e.g. under the existing framework of the Union for Ethical BioTrade), firms will be able to publicly demonstrate their commitment to sustainability and equity. This represents the first exchange in an ongoing dialogue on Blue BioTrade between UNCTAD, CAF: development bank of Latin America, and their regional and national partners throughout the world.

Expanding Blue BioTrade will require clear guidelines expressly tailored to the marine and coastal environment, as both the governance arrangements and ecological characteristics of oceans very different from land-based economic sectors. Four industries should be regarded as priorities for Blue BioTrade: (i) fisheries and aquaculture; (ii) marine-based pharmaceuticals and cosmetics; (iii) marine and coastal tourism, and (iv) carbon capture and sequestration. Leveraging Blue BioTrade principles can enhance both the economic value of natural capital, which supports food production, tourism, and a range of other economic activities, as well as the noneconomic benefits of ecosystem services, including water-quality maintenance, carbon sequestration, shoreline stabilization and disaster mitigation, scenic beauty, and the cultural worth of traditional livelihoods. Blue BioTrade focuses on the interconnected values and benefits of ecologically healthy, well-managed marine and coastal habitats to achieve sustainability and enhance economic efficiency.

Blue BioTrade principles should be aligned with the policies of coastal nations within the framework of the United Nations Convention on the Law of the Sea and its implementing agreements, especially in areas that are beyond any national jurisdiction. Blue BioTrade is also relevant to the first and second objectives of the Convention on Biological Diversity, and it can help ensure that the exploitation of coastal and marine resources does not exceed the ecosystem's maximum sustainable yield[2] or regenerative capacity. Blue BioTrade can also promote the equitable sharing of benefits derived from the use of marine biodiversity by helping to establish clear rights of access, use, and ownership over marine and coastal resources and by leveraging traditional ecological management knowledge and benefit-sharing systems. As an expanding array of organizations, businesses, and communities adopt Blue BioTrade principles for ensuring ecological sustainability, economic efficiency, and social equity, the immense value of the world's oceans will continue to grow.



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1. OCEANS, THE BLUE ECONOMY, AND THE NEED FOR SUSTAINABILITY

1.1 Introduction

Sustainable trade in marine and coastal goods and services

Oceans dominate our planet to a far greater extent than many of us realize. The vast majority of the world's 195 sovereign nations have coastlines, along which the bulk of the world's populations resides. The global economy is inextricably tied to the health and productivity of marine and coastal ecosystems, ad seas and coasts are filled with valuable assets that support countless livelihoods, generate vital fiscal revenue, provide for the wellbeing of local communities and visitors, and play a key role in climate-change mitigation. Oceans and coastal areas are a major component of the global food supply—to which they contribute directly, through marine fisheries and aquaculture, and indirectly, by supporting land-based agriculture—and marine resources are vital to the food security of communities around with world. Marine and coastal ecosystems also provide essential water and energy resources, as well as vitamins, enzymes and other nutritional compounds, pharmaceutical and herbal medicines, and industrial inputs such as dyes and oils. Collectively, these resources support a growing sector of global trade and an important contributor to economic output in countries around the world. Marine and coastal environments are likely to become increasingly important as global populations grow, land becomes scarce, the climate changes, and new markets for marine products and services emerge.

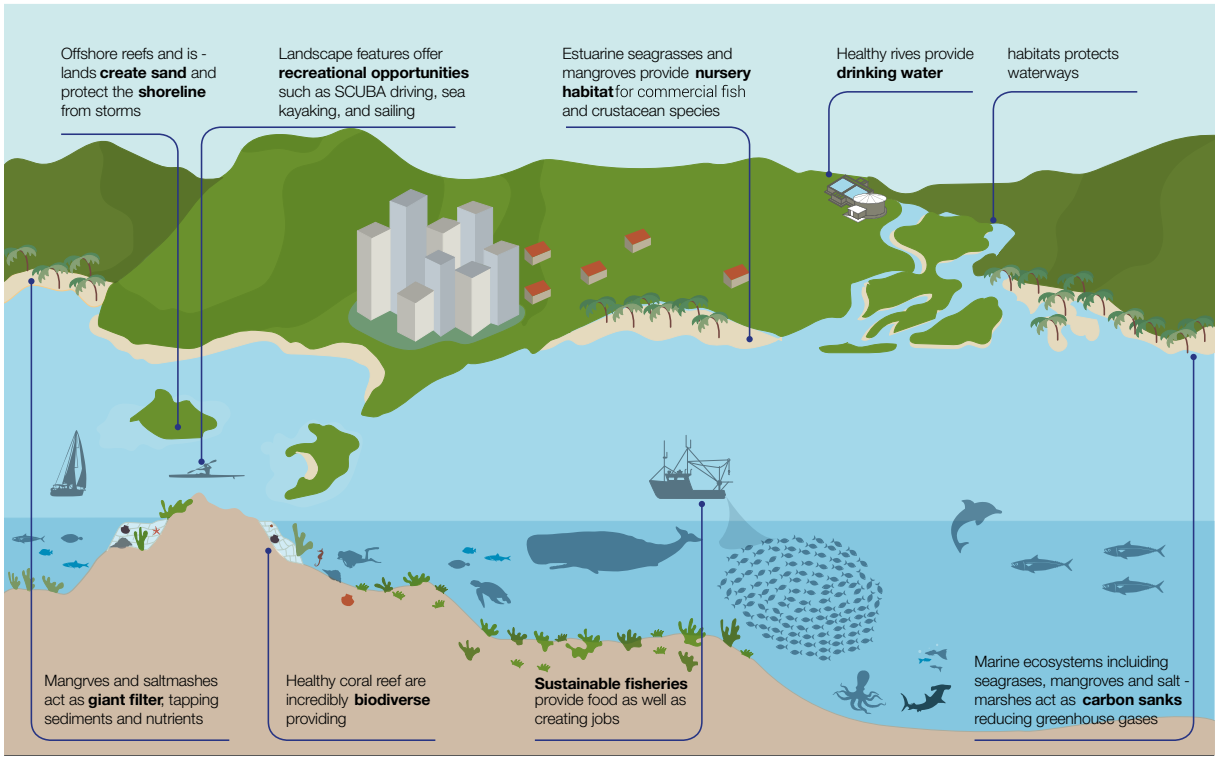
As the world's growing population increasingly looks to the sea for food, pharmaceuticals, minerals, desalinated drinking water, energy, and recreation, threats to the sustainability of marine and coastal resources are intensifying. The failure to adopt a holistic approach to managing marine and coastal systems has resulted in the uncoordinated development of fisheries, energy, mining, bio-prospecting, tourism, and other economic activities. Across the world, marine-use policies do not consider important trade-offs and do not capitalize on the synergies that a more comprehensive approach would provide, undermining sustainability and even provoking conflict over scarce resources.[3] Marine fisheries are wholly dependent on marine and coastal biodiversity and productivity, yet many national and transnational fishing operations ignore basic principles of conservation, degrading ecosystems and devastating biodiversity through overexploitation, destructive fishing practices, and uncontrolled waste and pollution. Fishery rights are not always allocated equitably, workers are often treated poorly, and benefits are not shared with local communities. Bio-prospecting for food additives, pharmaceuticals, and personal care products[4] has a similarly unsatisfactory record with regard to environmental sustainability, equitable benefit sharing, and respect for tenure and other rights. The same is true of marine and coastal tourism. A shift toward more sustainable and equitable exploitation of both extractive and renewable marine and coastal resources could yield dramatic social, environmental, and economic gains.

Trade policies grounded in sustainability and equity can help build a foundation for the responsible, integrated, long-term management of marine and coastal resources. The principles that ensure that trade can be sustained without undermining biodiversity—commonly known as "BioTrade" [5]—can be adapted to the marine and coastal setting through the emerging concept of "Blue BioTrade." The principles and criteria that underpin Blue BioTrade can support sustainable fisheries and aquaculture, marine ecotourism, and bio-prospecting. This report describes the enormous potential of Blue BioTrade and offers guidance for realizing it.

An ecosystem-services perspective, which examines the real and potential value of marine and coastal systems in providing goods and services that benefit humans, can help frame the challenges that Blue BioTrade is designed to address. While adopting this perspective is not necessary to develop effective Blue BioTrade projects and policies, it can make help public official, investors, members of civil society, international development institutions and other stakeholders evaluate where the potential for Blue BioTrade and prioritize interventions accordingly. Ecosystem-based management, value chains, and sustainable livelihood can make economic activities more sustainable and resilient, which supports the goals of Blue BioTrade.

Ecosystem-based management provides a holistic perspective on marine and coastal resources that includes their socioeconomic value as well as their economic benefits. An ecosystem-services

Figure 1: Examples of ecosystem services



Source: Agardy et al., 2011.

perspective can help to determine what level and types of ecosystem uses are sustainable by assessing how use impacts not only the exploited resource itself, but also the quality of other socially and economically valuable ecological systems (Figure 1). Conservation is one of the components of ecosystem-based management, and by explicitly considering the wellbeing of humans who directly and indirectly rely on various ecosystems, the ecosystem-services perspective can reduce risks to environmental, social, and economic sustainability.

The unique socioeconomic, political, and ecological characteristics of marine ecosystems require innovative conservation solutions. The status of the world's oceans as a global commons governed by international laws and conventions creates unique challenges for the sustainable exploitation of, and trade in, marine resources. In addition, marine and coastal ecosystems tend to be much more ecologically open and porous than land ecosystems, and they harbour an exceptional number of migratory and far-ranging species. Consequently, marine and coastal ecosystems tend to be much more vulnerable to distant threats than terrestrial ecosystems.

As global climate change intensifies, and the cumulative pressure from the underregulated exploitation of marine resources and inadequate watershed management increases, economic competition for limited resources will push oceans governance to its limits.[6] The capacity of national governments to manage resources in their territorial waters varies substantially, and coastal areas with weaker governance require special attention. Building local capacity is increasingly urgent, as coastal nations are recognizing the considerable potential to expand the exploitation of marine resources and increase trade in ocean-based products and services. Meanwhile, new innovations are allowing private firms to expand economic activities at sea and in coastal areas. Current and projected future uses of the ocean environment, including wild-capture fisheries and aquaculture, desalination, renewable and non-renewable energy extraction, mineral mining, bio-prospecting, and coastal development to support tourism all impact biodiversity.

Integrating BioTrade principles and criteria (see Figure 1) into oceans governance can lessen the negative impacts of economic activity and promote the sustainable use

Box 1: "BioTrade" versus "biotrade"

While "BioTrade" and "biotrade" may appear interchangeable, the capitalization of the term BioTrade reflects a fundamental difference in its definition. The term "biotrade" is sometimes used to describe trade in biological resources, such as plant material used as an input for food, cosmetics, or industrial products, but it does not imply that such trade is ecologically sustainable or equitable in its distribution of benefits.

By contrast, BioTrade activities are characterized by respect for environmental, economic, and social wellbeing by maintaining the integrity of the ecosystems in which species or resources are being collected, cultivated, or observed. Income should be equitably distributed to all actors across the value chain, and resource-use decisions should be made on an inclusive and participatory basis. BioTrade is governed by a set of non-binding principles and criteria, which enables it to be formally institutionalized.

Source: UNCTAD (2017a), Handbook on Access and Benefit Sharing and BioTrade.

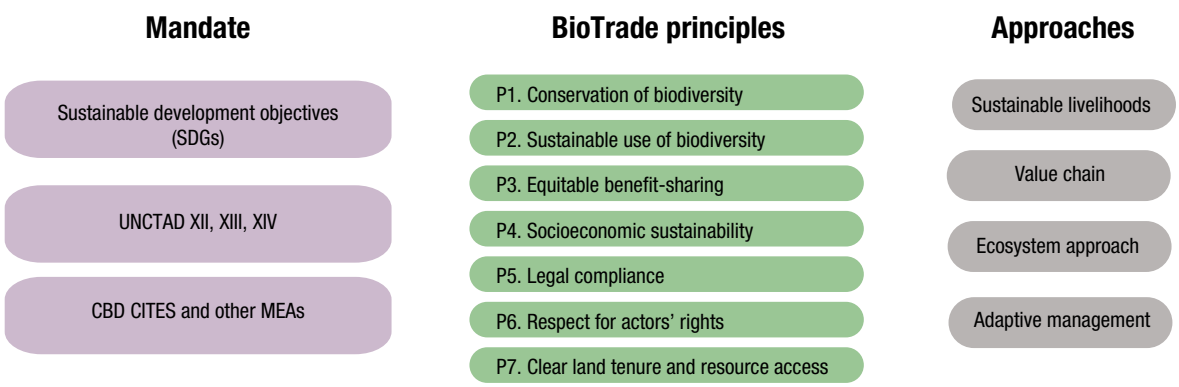
of scarce and vital oceanic resources. Grounding Blue BioTrade principles and criteria an ecosystem-services approach to analysis and policymaking will establish a foundation for responsible investment[7] and provide a framework for international collaboration.[8] As the core concept of BioTrade was originally developed for terrestrial resources, ecosystems, and economic activities, creating a new Blue BioTrade approach will be necessary to achieve the global sustainability of marine and coastal ecosystems.

An introduction to the concept of BioTrade, its principles and minimum requirements

The United Nations Conference on Trade and Development (UNCTAD) defines BioTrade as "the activities of collection/production, transformation and commercialization of goods and services derived from native biodiversity under criteria of environmental, social and economic sustainability." BioTrade supports progress toward the objectives of the Convention on Biological Diversity (CBD), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Sustainable Development Goals (SDGs), and UNCTAD's Nairobi Maafikiano. The concept of "BioTrade" is distinct from "biotrade," which is a much broader category of trade (Box 1).

BioTrade encompasses an expanding range of goods and services, including personal care, natural pharmaceuticals, and phytopharma, nature-based fashion, horticulture products, handicrafts, textiles, sustainable nature-based tourism, and forestry-based carbon credit generation. In 2015, total BioTrade sales were estimated at €4.3 billion, and over 5 million people directly benefitted from global BioTrade.9 Currently, an estimated 83% of consumers surveyed expect

Figure 2: The BioTrade conceptual framework: mandates, principles and approaches



Source: UNCTAD (2017b).

companies to have sourcing policies in place that protect biodiversity,10 and BioTrade can help satisfy the growing consumer demand for sustainability.

Informed by more than 20 years of experience in implementing biodiversity-based approaches across a vast range of value chains and sectors, the BioTrade concept has successfully promoted sustainability and equity through both government policies and private-sector initiatives. BioTrade is a sustainable-sourcing model that is primarily applied on a business-to-business basis, though in recent years business-to-consumer applications have also proven successful. Like BioTrade overall, Blue BioTrade can build on international mandates and agreements, such as Sustainable Development Goal 14, paragraph 100t the Millennium Ecosystem Assessment, UNCTAD's Nairobi Maafikiano,[11] and several portions of the Call to Action of the United Nations Conference on Oceans.[12]

Based on best practices, lessons learned and the successes of BioTrade, the emerging concept of Blue BioTrade[13] has considerable potential to promote sustainability and equity in the production of marine-based goods and services. However, the principles and criteria of Blue BioTrade, as well as the guidelines and tools for implementing it, must reflect the unique characteristics of marine and coastal environments. As with land-based BioTrade initiatives, a set of minimum eligibility requirements must first determine what can and cannot be considered Blue BioTrade. The minimum requirements that a Blue BioTrade initiative must satisfy include:

- Focusing on material derived from coastal and marine biodiversity (e.g. living coastal and marine species);
- Refraining from unsustainable mineral extraction of sands, metals, oil and gas, and from unsustainable energy generation;
- Neither using nor developing genetically modified organisms;
- Neither introducing nor encouraging the introduction of invasive species;
- The activity does not harvest/catch, use, disrupt, or otherwise threaten endangered species, including those covered in CITES Appendix I and in national and regional endangered-species lists;
- Neither causing nor encouraging the degradation or transformation of marine and coastal ecosystems, e.g., via the draining of wetlands;
- Neither undertaking nor encouraging any form of illegal, unreported, and unregulated (IUU) fishing or other illegal activities, per the United Nations Food and Agriculture Organization (FAO) International Plan of Action to Prevent, Deter and Eliminate IUU Fishing; and[14]
- Applying the precautionary approach, as described in the Rio Principles and in the United Nations Fish Stocks Agreement of 1995.[15]

In addition to this set of minimum eligibility requirements, Blue BioTrade reflects the same seven principles and criteria that define BioTrade. These are: (i) the conservation of biodiversity, (ii) the sustainable use of biodiversity, (iii) fair and equitable benefit sharing, (iv) socioeconomic sustainability, (v) legal compliance, (vi) respect for stakeholders' rights, and (vii) clear land tenure and equitable access to resources. Blue BioTrade must adapt these principles to marine and coastal contexts, and proposed changes are detailed in Annex I. Successful BioTrade approaches include working through the value chain, contributing to the development of sustainable livelihoods, and adopting ecosystem-services perspectives and adaptive management.

In addition to the development of specific Blue BioTrade principles and criteria, the norms and standards defining BioTrade must be adapted to account for the unique economic, political, and ecological characteristics of marine resources. Whereas land tenure and ownership rights to terrestrial resources are often clearly defined and protected by the laws of a single government, rights of ownership and access to marine resources tend to be more complex and vary across different types of jurisdiction, which include national territorial waters, exclusive economic zones (EEZs), and areas beyond national jurisdiction (ABNJs), also known as the "high seas". Due in part to the inherent challenges of defining and enforcing tenure rights, access to marine resources is often poorly managed or in some cases completely unregulated. In many cases, marine resources cannot be legally owned until after they are harvested. Whereas a herd of cows is always the property of the rancher, fish may only be owned once the fisher has landed the catch. Instead of protecting ownership rights in the terrestrial sense, the local authorities regulate the catch according to formal licensing requirements or customary practices. Property rights over ocean space (analogous to land ownership) cannot be acquired by individuals, although seabed leasing does confer temporary exclusive use rights to leaseholders over extracted oil and minerals.

In addition, marine and coastal ecosystems tend to be

much more ecologically open and porous than land ecosystems, and they harbour an exceptional number of migratory and far-ranging species. Consequently, marine and coastal ecosystems tend to be much more vulnerable to distant threats than terrestrial ecosystems. Due to marine and coastal connectivity, ecosystem interactions, and the migratory nature of many aquatic species, the concept of "native" species may be less relevant to Blue BioTrade.

Among the greatest threat to the maritime economy is the general lack of knowledge or accountability regarding the value of goods and services originating from the sea. Tracking the impact of economic activities based on indicators of marine and coastal biodiversity is challenging, as the available data on the status and exploitation of marine biota are deeply inadequate. Whereas numerous data sources are available for the terrestrial environment, marine and coastal data come primarily from the official statistics reported by the world's fisheries. Value chains for marine and coastal products tend to be relatively opaque, due in part to the difficulty and cost of monitoring these value chains, which frequently encompass multiple jurisdictions with different levels of oversight capacity. Consequently, the origin of any given good is often hard to trace.

The inherent characteristics of marine product value chains make it difficult to determine whether a given product is labelled correctly in terms of its species, its origin, and the terms and conditions under which it was produced or harvested. In marine value chains, products from many sources are often lumped together by middlemen before they reach distributors and retailers. During this process, catches of protected species may be accidentally or deliberately mislabelled as non-protected species. The migratory nature of oceanic species complicates protection efforts, and harvesters may illegally access protected areas, then mislabel their product as legally derived. The challenge of maintaining effective surveillance at sea makes these transgressions far more difficult to identify than those on land. The challenge of observation also makes it difficult to verify whether a given catch was harvested using sustainable methods and in accordance with applicable laws and regulations. Blue BioTrade principles and criteria explicitly account for these unique characteristics of marine trade.

Objectives and structure of this report

This report is designed to launch a dialogue between CAF, UNCTAD and other stakeholders regarding the emerging concept of Blue BioTrade, its principles and criteria, and its application to ecosystem management, value-chain development, employment creation, and socioeconomic equity. Following the introduction, Section II of the report describes the "ocean economy" or "blue economy" and reviews the current state of knowledge surrounding the realized and potential value of marine resources and the methodologies for determining those values. Section III introduces key economic sectors relevant to Blue BioTrade, including fisheries and aquaculture, bio-prospecting, and marine and coastal tourism. Section IV discusses Blue BioTrade's relationship to marine ecosystem services, value chains, and adaptive management, and their complementary influence on sustainable livelihoods. Section V examines the current state of global trade in marine and coastal biodiversity commodities, the governance arrangements which underpin that trade, and the potential to transform commercial biotrade into Blue BioTrade via improved standards, certification, and labelling schemes. Section VI concludes with a list of policy recommendations for advancing Blue BioTrade, and Annex I presents a proposed set of Blue BioTrade principles and criteria tailored to the marine and coastal context. This report is intended as a starting point for further discussions among global BioTrade stakeholders.

2. OCEANS, THE BLUE ECONOMY, AND SECTOR CLASSIFICATIONS

The ocean economy supplies a wide range of foods, medicines, minerals, oil, energy, and other goods and services. Oceans currently provide nearly 20% of the world's total animal protein intake,[16] one billion people worldwide depend on fish as their primary source of protein. In some areas, including parts of Southeast Asia, seafood constitutes up to 90% of the population's daily protein intake. The ocean economy extends far beyond fisheries and aquaculture and encompasses extractive industries, such as mineral mining and oil and gas drilling, as well as to service sectors such as maritime transportation and coastal and marine tourism. Sustainably developing the ocean economy, bolstering its ability to support new livelihood opportunities and contribute to economic output, and fostering stewardship of coastal and marine areas were the subjects of the first United Nations Ocean Conference, held in June of 2017.[17]

Defining the ocean/blue economy

There is no single internationally accepted definition of the "ocean economy" or the "blue economy," and the way these terms are used varies across countries, experts and organizations. For example, Awni Behnam of the International Ocean Institute defines the blue economy as "living with the ocean and from the ocean in a sustainable relationship."[18] While UNCTAD has not yet published an official definition of the ocean economy or blue economy—terms which it treats as synonymous—it supports economic and trade activities that are based on the sustainable use and management of marine and coastal biodiversity, ecosystems, and genetic resources. UNCTAD's concept of the blue economy favours activities that are not natural-resource intensive, including low-carbon approaches to leverage environmental benefits, support sustainable livelihoods, and reinforce global food security.[19]

In addition to variations in terminology, countries and institutions apply different sectoral classifications to marine-based economic activities. The number of ocean-economy sectors ranges from six in the United States of America to 18 in the United Kingdom of Great Britain and Northern Ireland, and 32 in Japan. Moreover, the industries included in each sector also vary by country. For example, the United Kingdom does not include seafood processing as a marine sector, while France includes electricity generation by thermal and nuclear power, which no other country classifies as marine-based.

These definitions shape how the ocean economy contributes to national economic output and how marine-based activities are regulated. Policymakers may regard some marine-based sectors as priorities

Table 1: Definitions of ocean-based economic activities used by selected countries

Country	Definitions/ criteria
United States of America	Economic activity, which is: a) an industry whose definition explicitly ties the activity to the ocean, or b) which is partially related to the ocean and is in a shore-adjacent zip code
United Kingdom	Those activities that involve working on or in the sea. Also, those activities that are involved in the production of goods or the provision of services that will directly contribute to activities on or in the sea
Australia	Ocean based activity either because the ocean resource is the main input or because the access to the ocean is a significant factor in the activity
Ireland	Economic activity which directly or indirectly uses the sea as an input
China	The sum of all kinds of activities associated with the development, utilization and protection of the marine resources
Canada	Those industries that are based in Canada's maritime zones and coastal communities adjoining these zones, or are dependent on activities in these areas for their income
New Zealand	Economic activity that takes place in, or uses the marine environment, or produce goods and services necessary for those activities, or makes a direct contribution to the national economy
Japan	Industry exclusively responsible for the development, use, and conservation of the oceans
Republic of Korea	Economic activity that takes place in the ocean, which also includes the economic activity that puts the goods and services into ocean activity, and uses the ocean resources as an input

Source: Kwang Seo Park (2014). A study on Rebuilding the Classification of the Oceans Economy.

because of their contribution to overall value addition, while others may be valued primarily as a source of employment. Consequently, how each country defines and categorizes the ocean economy can play a major role in its policies toward marine-based economic sectors (Table 1).

Geographic location is an important criterion for defining ocean-based economic activities, but different countries apply different legal, ecological, and cultural interpretations as to what defines the coastal zone. For example, if coastal areas are defined as extending 100 km landward from the all shorelines, the worldwide coastal zone would encompass more than 61% of global GDP. Even the somewhat narrower definition used by the 2003 Millennium Ecosystem Assessment suggests that at the time of analysis nearly 40% of the global population lived in coastal areas, which comprise just 5% of the Earth's inhabitable land area.[20] The FAO definition of coastal areas includes large inland lakes, such as the Great Lakes region of the United States and Canada. This definition includes areas that are geographically distant from the ocean as part of the ocean economy. For example, Canada classifies the Montreal area, which is more than 2,000 km from the ocean, as part of its ocean economy because the St. Lawrence River provides a waterborne transportation link between Montreal and the ocean. Despite the lack of standard terminology and uniform classifications, the way that countries and institutions define the ocean economy and the sectors it encompasses it shed light on the range of economic activities that can be considered Blue BioTrade.

Classification of sectors and activities within the ocean economy

The United Nations Department of Economic and Social Affairs (UNDESA), the World Bank, and UNCTAD[21] have developed a classification system for ocean-based economic sectors that includes fisheries and aquaculture, bio-prospecting, pharmaceuticals, personal-care products, mineral extraction, renewable energy, shipping and transport-related industries, ports, monitoring, ocean management, carbon sequestration, waste management, and tourism, among others.[22] Only the UNDESA/World Bank/UNCTAD definitions formally include either a trade sector or trade subsector. While the world's oceans are a conduit for international trade and the source of many traded goods and services, most classifications of the ocean economy do not list individual trade sectors, and the few references to trade are mostly in relation to fisheries or transport. Trade-related activities are generally included in broader categories, such as "fishery production and commercialization" or "fishery and marketing," and specific references to trade are few and indirect. For instance, the French classification system includes fish marketing and trade as a component of the seafood-products sector, while Japan classifies fresh seafood wholesale trade as part of the marine-space-utilization sector, and the Republic of Korea defines transportation and sales as part of the seafood-processing sector.

Fisheries appear in all classifications, though with different names, scopes and details. In the United States the sector is named "living resources" and includes fishing, fish-hatchery operations, aquaculture, seafood processing, and seafood marketing—and since the United States definition of the ocean economy includes the Great Lakes region and rivers, the sector also includes inland fisheries. The United Kingdom classification does not include fish marketing and trade, but the French classification does. China defines the marine fishery sector to include marine aquaculture, fishing, fishing-related services, and aquatic processing. Japan identifies four subsectors under the open-space-activity sector, coastal fishing, offshore fishing, deep-sea fishing and sea aquaculture industry, and another four subsectors under the marine-space-utilization sector: frozen seafood, fishery-product bottling and canning, other aquatic food and fresh sea food wholesale and trade. Similarly, the Republic of Korea classification has a marine-based industry sector and a marine-related industry sector. The marine-based industry sector includes capture fisheries, aquaculture, and fishery-related services, while the marine-related-industry sector includes seafood processing, transportation and sale, and marine bio-food industry.

The Organisation for Economic Co-operation and Development (OECD) defines the ocean-activities sector to include a capture-fishery subsector, which encompasses catch production, seafood processing, the preservation of fish, crustaceans, and molluscs, the production of fishmeal for human consumption and animal feed, and seaweed (see example in Box 3 below) processing. The classification of "emerging ocean industries" includes aquaculture. The European Union identifies eight economic groups and 16 sectors as part of the ocean economy. The living-resources group comprises two sectors: fisheries and aquaculture and blue biotechnology. The fishery-aquaculture

sector includes commercial marine fisheries in oceans and coastal waters, marine aquaculture, freshwater aquaculture, processing and preserving of fish, crustaceans, and molluscs, prepared foods, other food products, and the manufacture of oils and fats.

Tourism appears in all classifications of the ocean economy under names such as "coastal leisure and entertainment," "marine and coastal tourism," etc. The sector comprises a wide range of businesses, including boat dealers, aquariums and zoos, travel agencies and tour operators, hotels and restaurants, cruise lines, marine sports, and recreational fishing, among others. Some experts consider this an overlapping category, since hotels, restaurants, bars, retailers, and other tourism service providers in a coastal area may serve local residents and business travellers in addition to tourists. The magnitude of the sector is greatly influenced by how "coastal area" is defined.

Other activities and sectors, including energy, mining, and transportation contribute to the ocean economy but are not analysed in this report, as Blue BioTrade focuses on trade related to biodiversity and living resources. Blue BioTrade sectors include fisheries and aquaculture, bio-prospecting and biotechnology based on marine and coastal biodiversity for food, pharmaceutical and cosmetic industries, and marine and coastal tourism. While other activities may be included under the rubric of Blue BioTrade, this analysis concentrates on a core set of activities that are clearly within the concept's parameters. Blue BioTrade also encompasses carbon market credits

Table 2: Selected components of the ocean economy relevant to Blue BioTrade

Ocean-based sectors	Subsectors/activities	Drivers of growth
Sea food catching and harvesting	Fish harvesting, mollusc and crustacean gleaning Fish and seafood processing, packaging, marketing Trade in seafood products Aquaculture and algal culture Harvesting aquatic and coastal plant species	Population growth, income growth, and urbanization; rising food and protein demand; improvements in fishing, processing, storage, and transportation technologies; improvements in aquaculture technology and efficiency; advances in nutraceutical and functional food technology
Trade in non-food ocean products	Marine biotechnology Bio-prospecting Products that incorporate natural ingredients, including seaweed-based biofuels	Increasing demand for new pharmaceuticals, health and personal care products; advances in genetic technology; increasing financial support for new pharmaceuticals and other products, increasing bio-prospecting activities
Sustainable nature-based tourism and recreation	Sustainable hotel and restoration services Eco-tourism Tour operators Sport fishing Whale-watching, wildlife observation and sustainable diving Marine parks, protected areas, ex situ reproduction sites, aquaria, museums, historical sites, etc.	Global growth of tourism; increasing accessibility of formerly remote locations; increasing dive certifications; lower overall travel costs; expansion of innovative models of tourism; combined tourism and volunteerism
Activities supporting carbon sequestration	Sustainable management of forests and mangrove estuaries REDD+ reforestation projects Carbon measurement services Carbon finance	Increasing coastal and ocean-based conservation activities; an expanding range of green financing instruments; increasing number and sophistication of climate-change mitigation strategies
Land-, water- and air-based monitoring	Technological research and development Marine environmental consulting	Increasing research into ocean-related technologies; intensified focus on the conservation of ecosystems and species
Marine and coastal management and restoration	Marine and coastal protection, conservation, cleaning and restoration services	Increasing number of national sustainability and resilience strategies; greater focus on active restoration; expanding scope of marine protected areas
Waste management and disposal	Treatment and sustainable disposal of nutrients and wastes Recycling and reuse	Increasing number of national sustainability and resilience strategies, increased recycling activity; intensified focus on reducing natural-resource input

Source: UNCTAD (2018) based on World Bank and DESA (2017).

generated by so-called "blue carbon habitats," like mangrove forests, saltmarshes, and seagrass beds, as economic activities that rely on marine and coastal biodiversity and are sometimes tied to best practices for sustainable ecotourism and fishery management (Table 2).[23]

Estimating the value of the ocean economy

A range of indicators can help gauge the value of the ocean economy. These include traditional economic measures such as contribution to GDP, sectoral value addition, employment share, aggregate labour income, and contribution to export earnings, as well as metrics focused on social wellbeing, such as share of the population that depends on marine and coastal economic activities for their livelihood, the role of marine resources in local and national food security, and the estimated value of marine and coastal ecosystem services. These indicators can be used to estimate the value of the ocean economy from different perspectives and in the context of different policy goals.

The OECD recently estimated the value of the worldwide ocean economy, in terms of value added, at US$1.5 trillion. This represents approximately 2.5% of the total gross value added by the global economy. Offshore oil and gas accounted for the largest share of the value added by the ocean economy (33%), followed by coastal and maritime tourism (26%), ports (13%), maritime equipment (11%), and other maritime industries (less than 5%). Industrial marine capture fisheries currently contribute about 1% to the gross value added by the ocean economy. Due to data limitations, artisanal fisheries are not included in the OECD calculations, but artisanal fisheries have been estimated to represent almost 50% of world fishery production.[24] In 2014, UNCTAD estimated the economic value of ocean-based trade-related sectors at US$3 trillion.[25]

The World Wide Fund for Nature (WWF) has estimated the global value of the world's oceans at US$24 trillion.[26] Trade, transportation, and maritime shipping were valued at US$5.2 trillion, while the values of productive coastlines and carbon-absorption capacity were estimated at US$7.8 and US$4.3 trillion, respectively. In 2007, the United Kingdom government estimated that the total sales of the world marine industries at US$4 trillion, equivalent to 3-4% of global GDP.[27] In 2012, the Chinese government estimated the value of its ocean-based economic sectors at 9.6% of China's GDP;[28] and in 2005 the Republic of Korea Maritime Institute estimated that ocean-based economic sector added 5.5% to the Republic of Korea's GDP.[29] The value of some marine and coastal systems is calculated per unit area. For example, the ecosystem services provided by mangroves have been valued at US$57,000 per/ha/year, as they not only provide food and materials, but also stabilize shorelines, improve water quality, buffer inland areas and harbours from storms, sequester carbon to mitigate climate change, and support a wealth of biodiversity.[30] Similarly, coral reef ecosystems provide an estimated US$29.8 billion in net benefits each year via tourism, fisheries and coastal protection.[31]Australia's Great Barrier Reef generates an estimated US$5.7 billion each year through direct and indirect economic activities that employ nearly 69,000 people.[32]

The OECD also estimates that the ocean economy directly provides nearly 31 million full-time jobs, employing 1% of the total global workforce or about 1.5% active global workforce. Capture fisheries account for 36% of oceans based employment, followed by marine and coastal tourism at 23%. All other sectors account for 1-8% of oceans based employment. According to the World Bank, most fishery workers are employed in the post-harvest value chain, which includes fish processing and marketing.[33] However, when indirect employment is included, the number of jobs created by the ocean economy rises to 350 million.

Moreover, the employment statistics do not present a full picture of the ocean economy's role in global livelihoods. The FAO[34] estimates that fisheries and aquaculture provide livelihoods for 10-12% of the world's population. Small-scale capture fisheries provide more than 90% of those livelihoods, and 97% of workers employed in small-scale capture fisheries live in developing countries. As noted above, artisanal fishing produces roughly the same amount of fish as commercial fishing, yet artisanal fishing employ 25 times as many workers (over 12 million people) and uses one-eightieth as much fuel.[35] There are also links to human wellbeing that extend beyond jobs in the formal market economy. Subsistence fishing and barter are also common in many developing countries.

The value of the ocean economy is derived from three major components. The first is the contribution of ocean-based economic activities to the market transactions recorded in national accounts. The

second is the value of unobserved transactions, including a large share of artisanal and subsistence activities, and their contributions to household income and food security. The third is the value of the ecosystem services that marine and coastal areas provide, which can be estimated empirically but is primarily in the form of positive externalities. While unsustainable resource exploitation represents a large share of the first component, living marine resources and ecosystems underpin the bulk of the ocean economy, and a significant share of these economic activities could be transformed into Blue BioTrade and financed through special mechanisms. (see Box 2) if a minimum set of criteria were met.

Box 2: Financing Blue BioTrade

The range of potential financing mechanisms for Blue BioTrade has expanded dramatically in recent years. Many international organizations, including the Environmental Defense Fund, the Resources Legacy Fund, Sea Pact, and the Conservation Finance Network, provide grants and technical assistance to firms, organizations, and communities striving to develop sustainable fisheries and aquaculture. Some of these organization also support the development of sustainable marine and coastal tourism, while others, such as Solimar International and Green Hotelier, focus exclusively on the tourism industry. Yet despite the proliferation of financing options for Blue BioTrade, local commercial banks and regional development banks remain the largest source of financing for sustainability-focused projects.

Multilateral institutions such as CAF also provide financing to national and subnational governments seeking to strengthen their capacity to sustainably manage coastal and marine resources. These institutions also provide direct project financing, and they tend to focus on mid-large-scale projects. The Global Environmental Facility (GEF), which was recently replenished for the seventh time since its founding in 1992, provides an expansive range of support to multiple actors involved in the ocean economy. The GEF works through its implementing agencies with firms, organizations, local communities, and national governments to promote the development of sustainable fisheries and support the cooperative management of international waters. For more information on Blue BioTrade value chain development and financing, see:

Sustainable fisheries and aquaculture

http://www.seapact.org/; http://resourceslegacyfund.org/ensuring-sustainable-seafood/; https://www.edf.org/oceans/fisheries-finance; https://www.conservationfinancenetwork.org/2018/06/20/investing-in-sustainable-fisheries; http://www.thegef.org/topics/fisheries.

Sustainable tourism

http://www.solimarinternational.com/; http://www.greenhotelier.org/destinations/finance-and-sustainable-tourism/; https://www.conservationfinancenetwork.org/2017/08/29/ecotourism-investment-begins-to-flourish; https://www.usaid.gov/sites/default/files/documents/2151/InvestmentWorkbook_4%5B2%5D.pdf; http://scioteca.caf.com/bitstream/handle/123456789/1190/economic%20contribution%20of%20coastal%20tourism%20to%20GDP%20in%20LAC_CAF_UNCTAD.pdf?sequence=1&isAllowed=y.

Governmental capacity building, multilateral lending, and international coordination

http://projects.worldbank.org/search?lang=en&searchTerm=&sectorcode_exact=AF; https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/company-resources/sustainable-finance/sustainable-fin-markets; http://www.oecd.org/tad/fisheries/; http://www.thegef.org/topics/international-waters.

3. THE OCEAN ECONOMY AND BLUE BIOTRADE

3.1 Blue BioTrade by economic sector

Fisheries and aquaculture

Three factors are driving the growing demand for fish and seafood: rising income levels, changing and diversifying dietary patterns, and population growth. Oceanic resources are especially important in areas where space for farming or ranching is limited, and both marine wild capture fisheries and aquaculture are critically important sectors for most coastal countries. Marine fisheries generate fiscal revenue, contribute to GDP, expand trade opportunities, create jobs, provide livelihoods for coastal residents, and are an important part of the cultural identity of many coastal societies. Coastal aquaculture can provide many of these same benefits (Table 2). However, increased capture fishing and offshore resource extraction have complicated efforts to effectively manage marine fisheries and aquaculture and led to mounting tension between competing interests. Overfishing, destructive fishing practices, excessive trawling of the seafloor, the wasteful discarding of by-catch; IUU fishing (particularly in ABNJs), perverse incentives created by subsidies, noncompliant flag states, piracy, unfair access agreements, limited benefit sharing, and a lack of public awareness regarding sustainable practices and environmental impact characterize much of the world's fishing industry.[36]

An estimated 35-38% of global fishery production enters international trade. According to UNCTAD and FAO, the export value of fishery production rose to US$152 billion in 2017, while marine wild capture has stagnated at about 90 million tons.[37] Steady prices increases reflect a widening gap between demand and supply for which aquaculture is not yet able to compensate, though well-regulated aquaculture can provide a viable alternative to capture fisheries that have been overfished. As seafood is a major food source for coastal populations, which have per capita fish consumption levels that are significantly higher than the global average, the role of fisheries and aquaculture in ensuring food security may exceed their export value or even their direct contribution to GDP.[38]

The ocean economy provides vital subsistence food and much-needed cash income in poor and marginalized coastal communities.[39] In less-developed countries, and particularly in remote coastal areas, fish is both a major source of animal protein and a critical source of micronutrients.[40] Encouraging governments, companies, and local communities to work together can help create sustainable and innovative fishery sectors, underpinned by ecosystem restoration and sustainable practices.[41]

Fishing is also culturally important, as about 12 million people engage in artisanal fishing as part of traditional livelihoods.[42] As a mainstay of many coastal communities, small-scale fisheries and aquaculture operations are often a key element of their social fabric.[43] Seafood also plays a central role in the traditional cuisine of many regions, which is a fundamental part of cultural pride and identity. Local cuisines also contribute to the growing cultural-tourism subsector.

However, the local production and consumption of seafood is under intensifying pressure from ever-expanding industrial fisheries, which export low-cost seafood around the world and provide fishmeal to support agriculture and aquaculture.[44] In many parts of the world, competition over access to resources between large-scale commercial fisheries and small-scale artisanal or subsistence fisheries has created conflict. This trend will be exacerbated as stocks become overexploited and the perverse incentives created by subsidies contribute to the overcapitalization of industrial fisheries, which further encourages overexploitation. This process is degrading fishery habitats and the ecosystems associated with them. To sustain the global fisheries sector, governments must commit to an ecosystem-based approach to managing fisheries and aquaculture, and companies must adhere to sustainable practices and the principles of Blue BioTrade.

Bioprospecting for natural marine compounds

Oceans have enormous potential to provide new compounds for pharmaceutical, nutraceutical, functional foods, personal care, and other uses.[45] The development of bio-based industries and the exploitation of the unique genetic and biochemical pool of marine biomes have led to an increase in bioprospecting. Bioprospecting is the systematic search for and development of new chemical compounds, genes, organisms, and natural products.[46] Because bioprospecting is an inherently

complex and costly activity, marine research and development firms require a high return on investment.

Nearly 30,000 known compounds are derived from marine areas, and since 2008 more than 1,000 compounds have been discovered each year.[47] Marine bioprospecting started in areas with long coastlines and warm temperatures: most invertebrates were first sampled in Asian seas, followed by Oceania, America, Africa and Europe.[48] Since the 1980s, bioprospecting for new marine products has increased significantly, and a 1996 study on patent applications on marine natural products revealed a substantial increase between 1980 and 1995.[49] Presently, the United States Food and Drug Administration (FDA) and European Medicines Agency (EMA) have approved seven drugs from marine organisms, mostly antitumor drugs, and nearly 20 marine-derived drugs are in clinical trials.[50] A 2015 study found that anticancer compounds represented more than half of the natural marine products discovered between 1985 and 2012.[51] Other compounds discovered during this period have antibacterial, anti-inflammatory, antifungal, antiviral, or analgesic properties. For example, Dictyolone 500 is produced under a Maltese patent from the brown alga *Padina pavonica* for the treatment of osteoporosis. Thousands of marine species have been collected for initial assessment, but usually only in very small amounts.[52] Bio-chemicals produced by marine invertebrates, algae, and bacteria have also been used in marine-derived drugs. For instance, two closely related compounds from a sponge have been used to treat cancer and the herpes virus.

Most bioprospecting for pharmacological purposes focuses on compounds with cytostatic and cytotoxic activity. These compounds often play a defensive ecological role by deterring predators, suppressing competing neighbours, inhibiting bacterial or fungal infections, or protecting against ultraviolet radiation. These chemical compounds have enormous medical

Box 3: Case study: Innovations in seaweed farming

Seaweed farming is becoming more common as demand for macroalgae-based foods and cosmetic compounds add to the existing demand for thickeners derived from seaweed. However, the new generation of seaweed farming operations is not only generating profits for local communities, but other benefits as well. For example, Acuisur's seaweed farming operation in Paracas, Peru cultures seaweed on strings suspended in a little-used area of Paracas Bay.[a] By employing workers from the local community, the operation provides livelihoods for fishers displaced from capture fisheries by competition. The operation also benefits the communities and businesses of the wider Paracas region by improving water quality and increasing marine and coastal biodiversity. The seaweed farm boosts the productivity of scallop fishermen and increases the profitability of restaurants that serve scallops and other local seafood.

The Green Wave 3-D farming model, which has been adopted by aquaculturists across the north-eastern United States,[b] involves culturing seaweeds, bivalves such as scallops or mussels, and sometimes oysters. Fish grow-out cages can also be added to the mix. The various components of the Green Wave model increase local coastal and marine biodiversity, productivity, and water quality. 3-D farms have even been placed in highly degraded waters to allow for "bioremediation," a process in which growing organisms clean polluted waters. Products created through bioremediation are not used for human consumption, but rather as biomass for energy generation or as inputs in industrial processes.

These innovative aquaculture enterprises provide resources and ecosystem services simultaneously and are typically surrounded by a buffer area that enables broader coastal and marine conservation. Innovative technologies and approaches like the Acuisur operation and the Green Wave model can facilitate both food production to biofuel energy generation. They can enhance the quality of other coastal and marine resources, promote job creation, and create positive externalities for other businesses and local communities.

a See http://acuisurperu.com/acuisur/mision-vision/; Last accessed 22 May 2018.
b See https://www.greenwave.org; Last accessed 22 May 2018.

potential, and scientists have barely begun to explore their applications.

However, microbial marine organisms are frequently in symbiotic relationships with higher organisms and cannot be cultivated alone in a pure culture, as their growth depends on the activity of their hosts. Cultivating the microorganism in axenic conditions creates a risk that only part of their biosynthetic genes will be transcribed, while many biosynthetic genes will not be expressed *in vitro*. Exploiting the genomic information of uncultivable microorganisms can help overcome the obstacle of symbiotic association.

In addition, it is difficult to secure an adequate, permanent supply of these organisms and compounds without harming the marine environment. Marine biotechnology presents three ways to overcome supply limitations: (i) aquaculture, fermenter cultivation, and genetic engineering; (ii) enzymatic synthesis; and (iii) modification by chemical synthesis and semi-synthesis. Genetic engineering is possible only with exact knowledge of the genetic information that allows for the isolation and expression of genes of organisms that cannot be cultivated—until now this approach has only been used only at the research level. Chemical synthesis can thus be realized for relatively simple products.

In addition to new pharmaceuticals, marine-derived compounds are currently used to create personal care products (e.g. algae, crustacean and sea-fan compounds), nutritional supplements (e.g. algae and fish compounds), and artificial bone (e.g. corals). Many marine compounds are also used in industrial applications (e.g. fluorescent compounds from jellyfish, novel glues from mussels, and heat resistant enzymes from deep-sea bacteria).[53] Some compounds have both pharmaceutical and cosmetic applications.[54] For instance, the anti-inflammatory and analgesic compounds isolated from a Bahamian soft coral (*Pseudoterigorgia elisabethae*) led to the development of bio-products now used in Estee Lauder skin care and cosmetics lines currently worth US$3-4 million per year.[55] Marine compounds also figure prominently in anti-aging beauty creams and natural, non-toxic sunscreen. Several cosmetic companies, including La Mer and Biotherm, specialize in “thalassotherapy,” utilizing compounds from macro-algae or seaweed. Trade in ocean-derived cosmetics is growing rapidly (Box 4), and the marine-based beauty creams created by Phytomer have consistently grown at a double-digit pace. Other marine-based cosmetic compounds include sponge collagen to enhance the skin, sunscreens made from marine carotenoids, seaweed-derived haircare products, sea mud and other facial treatments, brown algae-derived cosmeceuticals, and shark-derived compounds believed to promote a youthful appearance.[56]

Without appropriate regulation, bioprospecting and the extraction of marine compounds could lead to overexploitation and environmental degradation. Fortunately, many cosmetics companies demonstrate their commitment to sustainability and marine conservation by using environmentally friendly practices to source compounds from the sea, and some invest in protecting the places from which these compounds are derived. It is in these companies’ best interest to ensure that their sourcing areas remain pristine, as environmental degradation could negatively affect both product quality and public perception. Although marine bioprospecting to date has yielded few compounds that are sufficiently promising to provoke accelerate resource extraction, the potential for new discoveries and industries can be great. At present, bioprospecting companies who are successful in their search for new pharmaceutical or cosmetic compounds move from discovery to testing to experimentation aimed at creating these natural pharmaceutical or cosmetic compounds in the lab. But not all compounds can be synthesized in the lab, and aquaculture of organism that produce them naturally is sometimes a cost efficient way of producing these pharmaceuticals.

Companies that invest in bioprospecting, particularly for pharmaceuticals, must deal with patents and other intellectual property rights. When conducting expeditions to identify new and potentially useful compounds, pharmaceutical firms often base their exploration on the traditional knowledge of indigenous communities, which saves time and reduces the cost of random screening. However, due to insufficient regulation, the limited negotiating capacity of many indigenous communities, and a lack of enforcement mechanisms, indigenous communities and the countries in which they reside have been deprived of a fair and equitable sharing of the benefits arising from the use, development, and commercialization of marine genetic resources acquired through their traditional knowledge. Moreover, the unauthorized use of marine genetic resources and associated traditional knowledge has given rise to claims of “bio-piracy.” In addition, the access and benefit-sharing rules

that apply to marine bio-prospectors working within national jurisdictions are unclear.

Finally, marine bioprospecting activities must comply with national wild-collection, access, and benefit-sharing regulations in line with the CBD and the Nagoya Protocol. Currently regulations are unclear on the collection of marine genetic resources in ABNJ. However, in 2018 the United Nations will lead negotiations regarding the creation of a new international legally binding instrument for protecting marine biodiversity in ABNJ.

Marine and coastal tourism

In 2015, global travel and tourism generated US$7.2 trillion in revenue, or 9.8% of global GDP, and supported 284 million jobs, or about 1 in 11 jobs worldwide.[57] At 3.1%, the growth rate of travel and tourism exceeded the world's overall economic growth rate. Despite headwinds, the sector is estimated to have outperformed global GDP growth again in 2016.[58] Tourism directly contributes to GDP in the form of capital investment and employment, and it creates both upstream and downstream supply-chain effects. Marine and coastal tourism is among the fastest-growing subsectors of the global tourism industry. The United Nations World Tourism Organization (UNWTO) estimates that half of all tourists visit coastal and island destinations.

Marine and coastal tourism includes mass tourism located in coastal areas, as well as nature-based tourism activities such as whale-watching, seabird watching, scuba diving on coral reefs, and other activities focused on marine biodiversity. Some nature-based tourism or ecotourism activities have guidelines designed to protect marine biodiversity and ensure that visits to sensitive habitats remain ecologically sustainable.[59] The largest component of marine tourism is so-called sun-and-sand tourism, which requires beautiful beaches, clean water, and aesthetically pleasing seascapes. Because sun-and-sand tourism is directly supported by healthy coastal and ocean ecosystems, it is naturally aligned with Blue BioTrade.

Fishers who are displaced from fisheries by declining fish stocks or by commercial fishing operations often find alternative livelihood opportunities in the ecotourism sector (Box 5). Ecotourism can, in turn, create an incentive for ecosystem preservation in the fishery sector. Careful planning and the application of Blue BioTrade principles can help ensure that the benefits of marine and coastal ecotourism are widely shared.

Beyond providing food resources, marine and coastal habitats support the wellbeing of communities and the economic vitality of coastal nations, and many uses and benefits of these habitats are complementary and interrelated.[60] For example, coastal habitats support nature-based tourism, which creates demand for local fishery products and expands the range of livelihood opportunities, thereby potentially reducing competition and conflict within the fishery sector. Some coastal and marine habitats, especially mangrove forests, protect

Box 4: Case study: Algotherm cosmetics

Algotherm is one of many cosmetic companies that utilize marine compounds for skincare and other wellness products. However, Algotherm is notable for its "Oceans Respect" line, which emphasizes the company's investment in sourcing ingredients from well-protected places in good environmental condition and in a manner consistent with best practices. Algotherm sources temperate seaweed from the North Atlantic coasts of France, Canada, Ireland, Morocco, and United Kingdom, as well as tropical seaweed from regulated places in Australia, Malaysia, the Philippines, Indonesia, and Bermuda. The company publicizes its commitment to respecting the national regulations regarding marine resource use and local regulations regarding the harvest season, which ensures plants are not harvested during their reproductive periods. Algotherm only uses harvesting methods that do not harm habitats or incidentally catch other species. Export of seaweed and derived compounds conform to international regulations, such as CITES, and Algotherm is committed to using environmentally sound technologies in its cosmetic production, including a reliance on renewable energy, methods that conserve water and heat, and low-impact packaging. The company's marketing stresses its commitment to marine conservation and urges its customers to offer their support as well.

ports and harbours, stabilize shipping channels, and buffer land from storms, contributing to the economic health of the shipping sector and boosting fishery output. When nature-based tourism incentivises the protection of wetlands, these habitats can deliver additional ecosystem services that add value to the coastal area. Wetlands that stabilize shorelines and control coastal erosion can prevent damage to public infrastructure and reduce the associated fiscal costs that would otherwise be incurred by local or national governments. Finally, while some benefits of pristine coastal and marine areas are difficult to value economically—such as recreational opportunities, community pride, and cultural integrity—these factors all contribute to human wellbeing.

For these reasons, determining the maximum sustainable level of use for a coastal or marine resource requires evaluating the system's ability to continue to generate that resource (i.e., the concept behind MSY), as well as how removal of that resource or use would impact the delivery of other services to other beneficiaries. This method of evaluation is complicated, because it requires that sectoral agencies, such as fisheries ministries, consider the impact of their sector on other sectors. However, the successful application of Blue BioTrade principles can promote the coordinated governance of marine and coastal areas, improving the effectiveness of regulations, reducing management costs, and ensuring that coastal and marine resources generate

Box 5: Case study: Whale watching in Baja California

Whale watching is a popular form of coastal and marine tourism, which in turn is the single largest segment of global tourism.[a] In its early days, whale-watching boats brought tourists as close to whales and dolphins as possible, with little regard to whether the activity was stressing whales and altering their behaviour. However, extensive guidelines now exist on how to observe whales responsibly.[b] In addition to formal guidelines, many local whale-watching activities rely on customary law and traditional knowledge, such as the community-led whale-watching operations in Mexico's San Ignacio Lagoon.

In the 1980s, after San Ignacio Lagoon was officially zoned as a refuge for endangered whales and a site for tourist development, a series of scientific studies of grey whales established the empirical foundation for key laws and regulations to protect marine mammals during observation. These included the NOM-ECOL-059-94, the Fisheries Law, the LGPEEPA, revisions to the federal penal code, as well as Mexico's ratification of CITES in 1984 and its declaration of San Ignacio has a UNECSO World Heritage site in 1993.

During the latter part of this period, the local inhabitants of the lagoon area became increasingly engaged in ecotourism services, enabling tourists to observe the grey whales and establishing strong relationships with scientists studying the animals. Expanding employment opportunities in ecotourism eased fishing pressures, with positive effects on marine biodiversity, and many tour operators and interpreters were former fishers, with an extensive knowledge of the sea and an immense cultural respect for the whales. The San Ignacio communities harnessed traditional knowledge and management techniques alongside government regulations to create a highly profitable and sustainable whale-watching industry. The community-based whale-watching enterprise now generates over US$3 million annually.[c] This initiative is a model for the rest of Latin America, where a decade ago nearly a million tourists were embarking on whale-watching tours, generating US$80 million in direct revenue and US$270 million in total revenue.[d]

a See http://www2.unwto.org/content/tourism-and-sdgs.
b See for example Higham, J., L. Bejder, and R. Williams. (2012). Whale-Watching: Sustainable Tourism and Ecological Management. Cambridge University Press.
c Brenner, L., M. Mayer, and C. Stadler. 2012. The economic benefits of whale watching in El Vizcaíno Biosphere Reserve, Mexico Economia, Sociedad y Territorio Vol 16 (51); Available at https://est.cmq.edu.mx/index.php/est/article/view/637; Last accessed 22 May 2018.
d Hoyt, E. and Iñíguez, M. 2008. The State of Whale Watching in Latin America. WDCS, Chippenham, United Kingdom; IFAW, Yarmouth Port, United States; and Global Ocean, London, 60pp.

sustainable livelihoods and other benefits.

Blue carbon credits

Plants serve many important functions, including producing oxygen, providing food, and storing carbon to slow anthropogenic climate change—a process known as carbon sequestration. Tropical forests were long believed to sequester the largest amounts of carbon, but in recent years research has shown that marine plants can trap carbon at an equal or even greater rate than tropical forests.[61] Mangroves sequester carbon at very high rates, and mechanisms are already in place to verify carbon credits for mangrove forests, enabling them to be traded on carbon markets.[62]

Generating "blue carbon credits" can yield revenue, but weaknesses in carbon markets call the economic viability of this mechanism into question. While blue carbon credits provide a further incentive to protect coastal ecosystems, the benefits of carbon sequestration have rarely generated enough motivation to overcome the economic and political costs of protecting marine and coastal habitats. Rather than providing a viable standalone solution, carbon sequestration can complement other revenue-generating ecosystem services, collectively incentivizing conservation of these habitats and the biodiversity they contain. For example, carbon credit generation can complement fish-nursery habitat protection or ecotourism-driven conservation, as part of a package of interventions that encourage the sustainable use of marine resources. In the experience of UNCTAD and CAF, augmenting BioTrade activities with carbon sequestration measurement and financing can magnify the benefits to local areas by creating short- and long-term incentives for conservation and sustainable use.

3.2 Threats to the sustainable use of coastal and marine ecosystems

Inadequately regulated coastal development, pollution, the overexploitation of fisheries, and the uncontrolled growth of tourism beyond the carrying capacity of sensitive habitats can badly damage or degrade coastal and marine ecosystems. Unsustainable resource use reflects weaknesses in governance, inappropriate policies, a focus on short-term economic gain over long-term planning, limited institutional capacity to manage population growth and movement along the coast, the prevalence of corruption, and a reluctance among some governments to consider co-management arrangements with local communities and user groups. However, the most important driver of marine degradation may be inadequate public awareness of the benefits that healthy and productive coastal ecosystems provide, as well as opportunities to benefit from them sustainably. Blue BioTrade can help highlight these issues and build demand for sustainable development.

The international literature reflects decades of experience in managing marine and coastal areas and using ecosystem resources sustainably. Diverse tools and approaches are available, and best practices can be elaborated for virtually any situation. Moreover, technological advances in monitoring, surveillance, modelling, and information management have greatly improved the efficacy of marine and coastal management. Yet while the knowledge base for sustainably using oceans and coasts is increasingly string, greater incentives will be needed to spur action.

In addition to bolstering fiscal revenue, the development of Blue BioTrade could encourage governments to adopt stronger policies in areas such as integrated coastal management or ecosystem-based management, as well as marine spatial planning and ocean zoning. Similarly, investments in green infrastructure that complement tourism development can enhance the quality of ecosystem services and increase the value of coasts for both visitors and residents. The demonstrated success of policies and projects that deliver environmental, economic, and social benefits can lead to the replication and expansion of sustainable development approaches.

While the actual and potential economic value of any individual ecosystem service can be assessed, no ecosystem exists in isolation from other ecological processes and ecosystem services. Natural systems are densely connected, and human wellbeing depends on multiple ecosystem services being delivered simultaneously. Due to these linkages and feedback loops, poor development decisions or carelessness that causes the loss of one habitat or species have potentially serious ramifications for other ecosystems and stakeholder groups. Therefore, a full accounting of the ecosystem services that oceans and coasts provide can shed light on the trade-offs involved in different policies and set the stage for successful sustainability-focused policies. In this context, Blue BioTrade can provide critical incentives to support the ecologically, economically, and socially responsible use of marine space and resources.

4. APPROACHES TO BLUE BIOTRADE

Blue BioTrade utilizes four approaches to achieve environmental and economic sustainability, along with equitable benefit sharing. The first is the ecosystem approach, which uses ecosystem-based management (EBM) to minimize the negative ecological impacts of resource use.[63] The second is the value-chain approach, which focuses on sustainability, value addition, employment, income generation and benefit sharing, *inter alia*, along the entire value chain, from supplier to end user. The third approach is adaptive management, which recognizes that environmental and socio-political conditions are always changing and that interventions must be constantly amended to ensure sustainability. Under Blue BioTrade, these three approaches must devote special considerations to the unique characteristics of trade that depends on marine biodiversity, including the openness of marine ecological systems, the challenges of restricting access, the lack of private property rights in the traditional sense, and the opacity of the supply chain. The fourth approach is sustainable livelihoods, which focuses on the role of natural resources in providing employment and income, especially for poor households. This approach is also applicable to Blue BioTrade, and it concentrates on addressing the needs of marine and coastal communities and leveraging the development opportunities provided by ocean-based value chains. The sustainable livelihoods approach to Blue BioTrade often involves working with artisanal fishers, aquaculturists, tourism operators, and informal workers in ocean-based sectors.

4.1 Ecosystem-based management

A rising share of the global population[64] lives in coastal areas, and the world's nations are continuously expanding their marine and coastal economic activities and their use of ocean space. This process is intensifying pressure on marine and coastal habitats, decreasing the productivity and profitability of ocean-based sectors, and increasing the vulnerability of coastal communities and cities to the effects of climate change. In this context, EBM has become one of the most widely used methods for managing ocean use and minimizing the negative impacts of exploitation. The EBM approach was catalysed by two trends in marine management that have unfolded over the past 30 years. The first was a shift in the focus of the fishery sector from stock production and MSY to a broader perspective on how the extraction of fisheries resources affects other fisheries and the wider ecosystem—a model known as ecosystem approach to fisheries. The other was the development and widespread adoption of integrated coastal management systems.

Rather than examining individual resources, species, or ecosystem services in isolation, the EBM approach adopts a holistic approach to the interactions and interdependencies within an ecosystem, including the role of humans. The five facets of marine EBM are: (i) understanding the connections between ecosystem elements, including species, habitats, and human activity; (ii) accounting for the direct and indirect contributions of ecosystem services to human wellbeing; (iii) assessing the cumulative impacts of human activity; (iv) managing resources across multiple uses; and (v) learning from and adapting to changing circumstances.

Marine and coastal habitats provide space and food for valuable fish species and provide the necessary resources for aquaculture, but these very same habitats also stabilize shorelines, buffer land and infrastructure from storms, clean and purify water, create opportunities for tourism and recreation, provide inputs for global manufacturing supply chains and local cottage industries, and support the web of biodiversity that keeps the entire planet healthy and productive. These ecosystem services are all interlinked, and unsustainable use of one habitat will result in the loss of other services and the degradation of other valuable resources.

Marine and coastal areas around the world are threatened by the cumulative pressures of large-scale urbanization, tourism development, energy generation, and industrial farming. Only a small percentage of the EEZs of coastal countries are under some sort of protection, and most marine reserves and marine parks are poorly managed. The marine and coastal protected areas that operate most effectively often include high-profile habitats such as coral reefs.

Most types of coastal habitats—including coral reefs, wetlands, kelp beds, seagrass meadows, sandy coasts, shellfish reefs, and upwelling areas—produce multiple goods and services. The specific ecosystem services that support fisheries and aquaculture include not only the direct supply of food and space

for the target species, but also vital indirect services such as nutrient cycling and prey production, areas to escape predation, access between habitats, and access to spawning grounds, including, in the case of anadromous species,[65] freshwater spawning grounds (Box 6).

Product safety and quality are vital to the profitability of many marine fisheries, and ecosystems that maintain water purity, suppress disease, and keep food webs in balance are essential to the safety and quality of fishery products. Moreover, the rise of sustainability certification—and the price premium it offers—is increasing incentives to protect habitats that support fisheries and enhance product value. However, these habitats are also under pressure from other types of resource use, including energy extraction and other economic activities, as well as indirect degradation. Understanding the links between ecosystems and human wellbeing is crucial to ensure the sustainable use of coastal and marine resources (Figure 3). As mankind becomes increasingly reliance on the sea, marine managers must work to ensure that ocean ecosystems remain healthy and productive in order to maintain the valuable resources and services that support livelihoods, industries, and economies.

The application of Blue BioTrade principles, including the use of ecosystem services valuations, environmental impact assessments (EIAs), and strategic environmental assessments (SEAs) for individual sectors can help maintain balance between uses and ensure that interlinked ecosystem services continue to deliver complementary benefits. Adopting

Box 6: Sustainable trade in wetlands-derived products and services, Ecuador

Under the Ecuadorian BioTrade Programme, the Ecuadorian Ministry of Environment, the Trade and Investment Promotion Corporation (CORPEI) and EcoCiencia implemented a BioTrade project called "Promoting Sustainable Trade in Products and Services Derived from Wetlands in Ecuador" (WGP214 29). The project was funded by the Dutch Ministry of Foreign Affairs/Directorate-General for International Cooperation (DGIS) as part of the "Partners for Wise use of Wetlands" programme, managed by Wetlands International with support from the Convention on Wetlands of International Importance (Ramsar Convention) and UNCTAD.

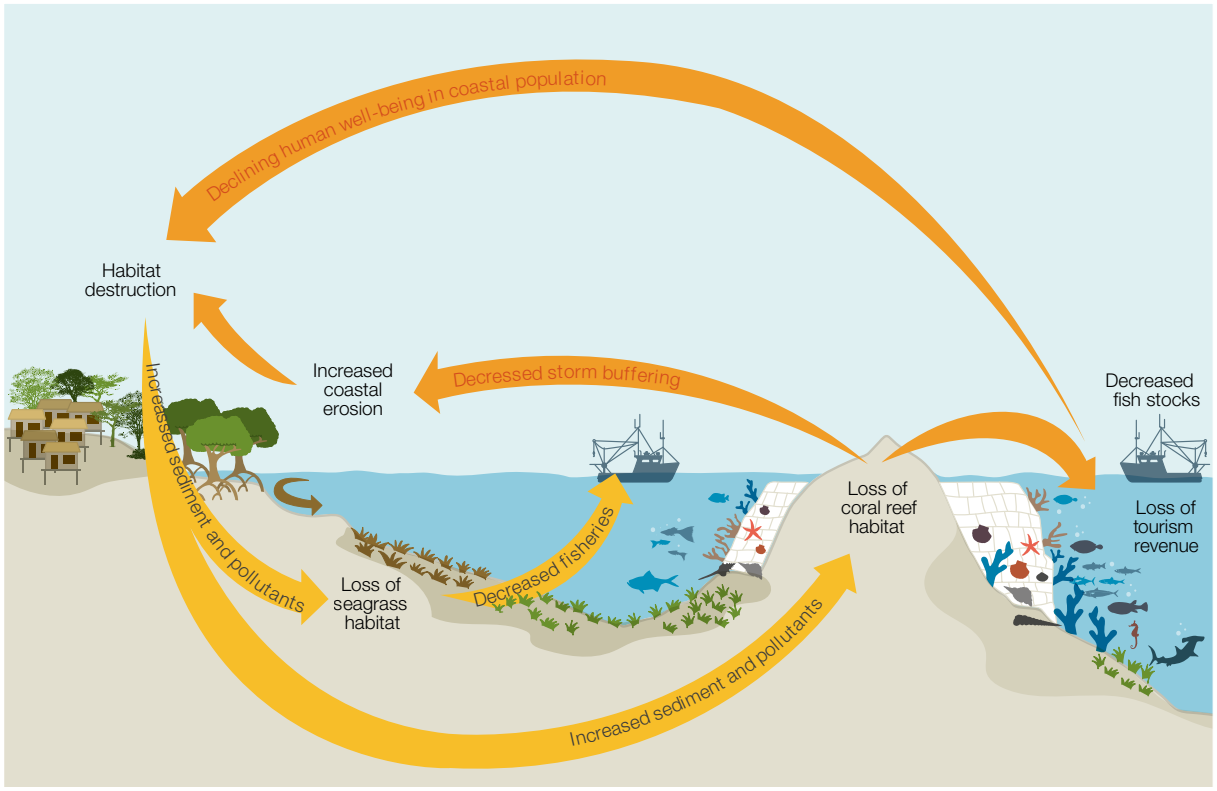
This one-year project aimed to consolidate wetlands conservation with poverty alleviation by fostering a sustainable trade in wetland products and services. The program developed a database of wetlands projects in Ecuador, and two of the program's three pilot initiatives related to the ocean economy:

Sustainable management of crabs (Ucides occidentalis) in wetlands areas under concession to the 6 July Crabs Association. This project, implemented in partnership with the Foundation Ecológica Rescate Jambelí, is located in the buffer zone of a Ramsar site, the Reserva Ecológica Manglares Churute. The project strengthened the governance of the 120-member 6 July Crabs Association and enabled them to learn more about the population dynamics of crabs to ensure a more sustainable harvest.

Sustainable management and commercialization of shellfish (Anadara similis and A. racemosa). The Province of Esmeraldas and the Canton of Muisne, in partnership with Fundación Fundecol and eight shellfish associations implemented a project that directly benefitted 600 families and indirectly benefitted 2,500 more. This project managed, repopulated, and monitored the state of molluscs in a canton that has experienced an 85 percent depletion of its wetlands due to unsustainable practices. The result was the development of a commercial market for shellfish through the active participation of local communities. The project included an awareness-raising and experience-sharing component for managing shellfish in enclosures, as well as workshops and the development of technical documents highlighting the importance of wetlands and outlining principles, criteria and indicators for ensuring social, economic and environmental sustainability.[a]

a Case study based on Argüello M., Briones E.E., Flachier A., Jaramillo L. and Tacoamán S. (2003). Proyecto de Promoción del Comercio Sustentable de Productos y Servicios de los Humedales del Ecuador. CORPEI / EcoCiencia.

Figure 3: Connectivity between ecosystems, and potential negative impacts on human wellbeing



Source: Agardy et al., 2011; UNEP EBM Manual.

Blue BioTrade principles and criteria can also facilitate the use of verification tools and certification methodologies, such as the Standard of the Union for Ethical BioTrade and those of other national and regional BioTrade partners.

4.2 Value chain approach

For almost three decades, the value-chain approach has provided a powerful analytical tool for strategic business planning and development policy.[66] The value chain is an interdependent system or network of productive activities that exists both within and between firms.[67] Efficiency gains are achieved by reducing costs at each stage of production and along the linkages between different stages.

The BioTrade value-chain methodology involves: (i) identifying sectors with untapped potential for Blue BioTrade; (ii) selecting targeted sectors and value chains; (iii) conducting a participatory assessment of those sectors and value chains; (iv) formulating a sectoral or value-chain development strategy; and (v) implementing, monitoring, evaluating, and revising that strategy.[68] The value-chain approach is designed to maximize value creation while reducing costs, mitigating negative economic or ecological impacts by eliminating inefficiencies, optimizing sustainable resource use, increasing and equitably sharing revenues among productive actors, and creating products that command a price premium. The value added through the chain includes wages and salaries, profits to entrepreneurs and asset owners, fiscal revenues, producer surplus, consumer surplus, and positive externalities. Reinvesting the returns of Blue BioTrade can help create a virtuous cycle of sustainability and growth.

While some BioTrade initiatives target existing segments of the consumer market, many focus on creating novel products for which no demand yet exists. BioTrade case studies reveal the critical importance of market-driven interventions that account for key issues[69] such as market access, market focus, partnering, collaboration and information sharing, and innovation. Blue BioTrade must also account for the common-pool nature of most marine and coastal biodiversity products and incorporate mechanisms to define and allocate rights to use resources in a manner consistent with long-term sustainability.

Fisheries value chain

The value-chain approach can be applied to fisheries, and it is often especially useful for small-scale fisheries, but like most marine bio-resources, fish are not considered private property until harvested. Some jurisdictions require fishing licenses, but private property rights only come into play after the fish or other target species have been caught. The fisheries value chain starts in the marine or aquaculture environment and ends with the consumer, and parallel value chains exist for fresh, preserved, and processed goods. The fisheries value chain can be disaggregated in the following activities: (i) harvesting: catching, cleaning, sorting, grading, and weighing; (ii) landing: cold storage, and icing, distribution to manufacturing point; (iii) cleaning: de-heading, slime removal, and meat/bone separation, and discarding waste; (iv) processing: salting, canning, packaging, branding; and (v) services and marketing: certification, transportation, marketing, wholesaling, and retailing (Figure 4).

Fisheries value chains differ depending on the species, the jurisdiction, the scale of production, and local socioeconomic conditions. The latter are particularly relevant for small-scale fisheries, as local conditions often define the characteristics of the entire value chain, and even in the same jurisdiction the value chain may differ from fisher to fisher,[70] or from species to species.[71] Species that are traded as major global commodities—such as tuna, salmon, and shrimp—tend to have much longer, more complex value chains than do species that are primarily traded in local markets.[72] Fisheries value chains also differ significantly according to the conditions that prevail in individual domestic, regional or international markets.[73] Also, industrial fleets and large-scale aquaculture producers may target different species (e.g., tuna, swordfish, salmon, and shrimp) than artisanal and small-scale fishers and aquaculturists (e.g., small and medium pelagic white or blue flesh fish, octopus, squid, etc.).

At each stage of the value chain, added value is expressed in terms of sale prices at landing, transportation fees, marketing fees, wholesale margins, retailer margins, profits by different intermediaries, final consumer prices, and taxes levied at various stages of the process. The value chain is supported by horizontally integrated firms and agents that provide tangible services, such as suppliers of fishing gears and boats, and intangible services, such as experts in targeting, catching, and handling specific species. Value-chain analysis can identify opportunities to increase the economic benefits of a given fishery by more efficiently utilizing scarce ecological resources or by improving processing, marketing and distribution. Value-chain analysis can promote sustainability, help local fishers and fishing communities remain competitive in an environment of increasing competition, and ensure that value chains deliver equitable benefits and prevent the abuse of market power.

Combining value-chain analysis with the ecosystem-based management approach

To align value-chain analysis with the EBM approach, best practices must apply to all ecosystems involved in the value chain. This include not only the harvesting site, but also the sites where processing occurs and where waste is disposed of. In the case of fisheries that rely on live bait, (e.g., pole and line fisheries for tuna), the value chain includes the ecosystem from which bait is supplied.

Due to the dependency of the fisheries value chain on multiple ecosystems, short-term profit maximization may be inconsistent with ecological sustainability.[74] Moreover, economic agents cannot maximize the use of all marine resources concurrently, and any sectoral development or conservation plan must consider the trade-offs involved.[75] In its series on the ecosystem approach to small-scale fishery value chains, the FAO describes the importance of assessing the linkages between ecosystem sustainability and the livelihoods

Figure 4: A simplified representation of the fisheries value chain

of local communities.[76] Accounting for different capture methods and technologies used by small-scale fishers, the value-chain analysis should assess performance in terms of catch potential and capacity with respect to stock.

Harmonizing the value-chain and EBM approaches under a Blue BioTrade framework requires developing institutional cooperation mechanisms to promote equitable benefit sharing and curb the use of ecologically damaging practices. Blue BioTrade initiatives must also consider the special circumstances of poor and vulnerable communities and provide them with the means to improve their quality of life and livelihoods, as sustainability reflects the balanced integration of economic growth, social responsibility, and ecosystem management. Defining a clear set of principles and criteria for Blue BioTrade can facilitate the creation of sustainable and equitable value chains based on marine biodiversity.

4.3 Adaptive management

Ecosystems and the human communities they support are changing rapidly, and management practices must change with them. Pressures on natural habitats that provide essential ecosystem services are intensifying, the productivity and profitability of degraded ecosystems is decreasing, and coastal communities and cities are increasingly vulnerable to the effects of climate change. In the BioTrade context, adaptive management contributes to the implementation of sustainable practices, the identification of impacts on species and ecosystems, the continual improvement of BioTrade initiatives, and the implementation of corrective measures on an ongoing basis.

Changing environments and evolving societal needs and expectations require that marine management adapt over time to stay efficient and effective. While this is also true for the management of terrestrial resources, the need for explicit adaptive management may be greater in the sea, where ecological changes may not be obvious and where many dynamics are accelerated. Due to the open, interconnected nature of marine ecosystems, ensuring sustainability requires interinstitutional monitoring and a collective mechanism for designing rules and regulations for the use of marine resources. Moreover, interinstitutional adaptive management must span national borders, as marine resources are shared by many countries and regions.

Adaptive management is necessary at all stages along the value chain, from source ecosystem to end consumer. Harvesting or use practices at the source may need to be adapted to maintain sustainable levels or remain within ecological carrying capacity. Distributors may have to find new suppliers, while transporters, processors, or other actors in the value chain may have to continuously adjust their practices to incorporate new information and technologies. Finally, retailers may need to alter their marketing strategies to ensure that they are effectively promoting sustainable trade.

Adaptive management must effectively track and adjust to rapid environmental and social changes. The impacts of climate change, for example, have been found to drive environmental change more rapidly in the sea than on land. For example, increasing ocean acidification and warming can dramatically impact marine production,77 especially for shellfish and coral reefs. Climate change is also eroding the resilience of marine ecosystems to the effects of overexploitation. Moreover, changes in seawater surface temperatures can affect migratory partners, altering harvesting areas and shifting national rights over stocks of different species. Blue BioTrade embraces an adaptive management approach that uses measurable indicators to assess environmental, economic, and social changes and create mechanisms to improve resource management and enhance the resilience of ecosystems.

5. BLUE BIOTRADE AND THE CURRENT OCEAN GOVERNANCE FRAMEWORK

In The Oceanic Circle, Elisabeth Mann Borgese stated that ocean governance is "a process, which will go on and never be completed. Ocean governance and terrestrial governance are parts of one system. The emerging system responds not only to the needs of the Ocean but of the whole earth. The respect we will have for each other we will have for all living things."78 And indeed, ocean governance continues to evolve. In 1982, UNCLOS developed a framework for international agreements surrounding ocean and marine issues, but the continuous emergence of new challenges has required updated implementing agreements, such as the United Nations Agreement on Conservation and Management of Straddling Stocks and Highly Migratory Fish Stocks (United Nations Fish Stocks Agreement of 1995). Other multilateral environmental agreements also cover issues related to: (i) land and marine biodiversity, under the CBD and the Nagoya Protocol; (ii) wetlands, under the Ramsar Convention; (iii) international trade in endangered wildlife, under the CITES and; (iv) highly migratory species, under the Convention on the Conservation of Migratory Species of Wild Animals.

FAO-backed treaties, regulations, and nonbinding guidelines regarding sustainable fisheries and marine harvesting are particularly important to ensure sustainable marine management, legal access to resources, and the maintenance of fish populations under the MSY. Other United Nations bodies have also periodically codified norms for ocean use, including UNCTAD, the World Trade Organization (WTO), the International Labour Organisation (ILO), and the International Maritime Organization (IMO), all of which have important implications for marine-based value chains.

Compliance with relevant international treaties and national laws and regulations is a key BioTrade principle. However, maintaining compliance with these regulations is typically easier in the terrestrial context than in the marine context, as terrestrial conservation and sustainability policies are primarily implemented by national authorities or through regional cooperation agreements, whereas marine conservation is an inherently multilateral or regional activity. Multiple regulatory systems cover issues ranging from marine safety to biodiversity protection and conservation to pollution prevention, and various United Nations agencies have specific mandates encompassing each of these areas. National regulatory structures are often not designed to ensure the sustainable use of marine resources, and in the absence of a single, comprehensive set of regulations, regulatory structures must be integrated piece by piece into existing legislation. While this piecemeal approach will continue over the near term, the SDGs strive to promote a more holistic approach to resource management. In addition, many global and regional governmental and nongovernment organizations (NGOs) work on marine environmental issues, and the private sector also has an important role to play through initiatives such as fishery improvement projects and certification schemes.

Various initiatives have been implemented to improve coordination between different organizations dealing with marine management within and outside the United Nations system. UN-Oceans was created in 2003 to, *inter alia*, strengthen the coherence of United Nations activities related to ocean and coastal areas.[79] In addition, the International Seabed Authority (ISA) was established under the UNCLOS to ensure that states which are parties to the convention organize and control activities in ABNJs.[80]

The United Nations Division on Ocean Affairs (UN DOALOS) exclusively focuses on maritime issues. The United Nations Oceanographic Commission (IOC) deals with oceanography and marine science, and the International Maritime Organization (IMO) concentrates on shipping and maritime pollution. Other United Nations agencies also have mandates that touch on ocean-related issues, including UNCTAD (trade-related aspects), FAO (sustainable management of fish stocks and food security), UNEP (conservation and regional seas programmes), UNESCO (cultural heritage), WMO (meteorological aspects), and ISA (deep-sea mining). Major NGOs involved in maritime issues include WWF, Greenpeace, Oceana, the Nature Conservancy, Wildlife Conservation Society, Conservation International, RARE, and Seas at Risk.

Effective tenure systems enhance economic efficiency and social stability, and mechanisms to guard against the hazards of open access are a precondition for sustainable resource management. However, marine-resource tenure systems and rights to use present unique challenges. In fisheries, tenure is frequently considered a "use" or "usufructs" right .[81] Tenure rights in fisheries are part of a broader system of formal and

customary rights, including traditional communal rights. Because access to fishery resources is closely linked to access to land, fishers and fishing communities must secure coastal or waterfront land rights, and thus land and fishery tenure rights often need to be jointly managed. Tenure is particularly relevant for small-scale and artisanal fishers, and community based-tenure systems may be necessary in some areas.

5.1 UNCLOS and relevant implementing agreements

The cornerstone of the current system of global ocean governance is UNCLOS, which acts as a "Constitution for the Oceans." UNCLOS is developed and implemented through sectoral and regional agreements, plans, and policies. UNCLOS is the only international convention that stipulates a framework for national jurisdiction in maritime spaces. Under UNCLOS, nations have sovereign rights and common responsibilities over the seas and the living and non-living resources within their jurisdictions. UNCLOS splits marine areas into five main jurisdictional zones, each with a different legal status (Box 7). This classification system provides a foundation for marine governance, as well as specific guidance regarding states' rights and responsibilities in each of the five zones. The importance of UNCLOS notwithstanding, Blue BioTrade should reflect all relevant multilateral environmental conventions and treaties, as well as national laws and regulations (Annex I).

The UNCLOS Preamble is especially relevant to Blue BioTrade, as it refers to the equitable and efficient utilization of sea resources, as are Articles 61 to 67, which concern the conservation and utilization of living marine resources, stocks of marine life, highly migratory species, marine mammals, anadromous, catadromous, and sedentary species in national EEZs. These and other articles describe aspects of sustainable marine-resource management.[82]

The United Nations Fish Stocks Agreement (1995) sets out basic principles for the conservation and management of straddling and highly migratory fish

Box 7: Marine jurisdictions

1. Internal Waters: include littoral areas such as ports, rivers, inlets and other marine spaces landward of the baseline (low-water line) where the port state has jurisdiction to enforce domestic regulations. Enforcement measures can be taken for violations of standards while in port as well as for violations occurring within the coastal state's maritime zones and beyond.

2. Territorial Sea: covers 12 nautical miles from the baseline. In this area, coastal states have unlimited jurisdiction over all (including foreign) activities unless restrictions are imposed by law.

3. Contiguous Zone: is an intermediary zone between the territorial sea and the high seas extending enforcement jurisdiction of the coastal state to a maximum of 24 nautical miles from baselines for the purposes of preventing or punishing violations of customs, fiscal, immigration or sanitary legislation.

4. Exclusive Economic Zone (EEZ) is an intermediary zone lying between the territorial sea and the high seas to the maximum extent of 200 nautical miles. Although high seas freedoms concerning general navigation principles remain in place, in this zone the coastal state retains exclusive sovereignty over exploring, exploiting and conserving natural resources. The coastal state can take action to prevent infringement by third parties of its economic assets in this area including, inter alia, fishing, bio-prospecting and wind-farming. In order to safeguard these rights, the coastal state may take necessary measures including boarding, inspection, arrest and judicial proceedings to ensure compliance with the international laws and regulations.

5. High Seas: lie beyond 200 nautical miles from shore, are to be open and freely available to everyone, governed by the principle of equal rights for all. On the High Seas, no state can act or interfere with justified and equal interests of other states. The Convention establishes freedom of activity in six spheres: navigation, overflight, placement of cables and pipelines, artificial islands, fishing, and marine scientific research.

Source: Simon O. Williams. Law of the Sea (2014) Mechanisms: Examining UNCLOS Maritime Zones. The Maritime Executive 82014. See: https://www.maritime-executive.com/article/Law-of-the-Sea-Mechanisms-Examining-UNCLOS-Maritime-Zones-2014-12-01

stocks.[83] It elaborates on the fundamental principle that nations should cooperate to ensure conservation and optimize utilization of fishery resources both within and beyond their EEZs. The Agreement stipulates that the conservation and management of fish stocks must be based on the precautionary approach and the best available scientific information. These management principles are particularly relevant to fish stocks that migrate from one EEZ to another.

Sovereign nations also have rights and responsibilities over the high seas, such as freedom of navigation and jurisdiction over domestically registered ships. Governments are responsible for issuing licenses and permits to access resources, protect endangered species, and preserve marine environments within their territorial waters.[84] In most countries, these responsibilities start at the coastline (baseline). In coastal communities, especially those reliant on fishing, national laws must be reconciled with traditional rights to marine resources. Many countries have experienced protests by local fishing communities against the infringement of traditional rights, for example through restrictions on fishing in Marine Protected Area (MPAs).

5.2 Governance on the high seas

Although specific agreements on governance and marine management on the high seas exist, they lack global enforcement mechanisms. UNCLOS establishes six freedoms of the high seas, which are further elaborated in the convention itself, other international and regional treaties and conventions, nonbinding guidelines, and national laws. These are: (i) navigation; (ii) overflights; (iii) the placement of submarine cables; (iv) the construction of artificial islands; (v) fishing; and (vi) scientific research. Of these, navigation, fishing, and scientific research are especially important to the development of Blue BioTrade on the high seas. Most activities on the high seas are subject to UNCLOS principles and obligations (e.g. conservation and cooperative management) and are monitored and implemented by national governments according to specialized treaties.

Some general principles for the conservation and sustainable use of marine biodiversity on the High Seas with origins in customary international law have been codified through international environmental agreements and non-binding declarations, including the 1972 Stockholm Declaration on the Human Environment, the 1992 Rio Declaration on Environment and Development, the Rio +20 Declaration, and the Call for Action of the 2017 United Nations Oceans Conference. The CITES regulations on “introductions from the sea” (IFS) are an important exception to UNCLOS freedoms. IFS is among the four types of trade regulated by CITES, and the IFS regulations are legally binding on the 183 parties to CITES. IFS regulations refer specifically to specimens taken on the high seas.[85] IFS certificates authorizing collection are granted if the scientific authorities can demonstrate that their activities are sustainable, that the specimens taken are not being used for commercial purposes, and, if the specimens are living, that the authorities are suitably equipped to care for them.

The first MPA with a high seas component was the trilateral Pelagos Marine Sanctuaries for the Conservation of Mediterranean Marine Mammals, established in 1998. Since then, more than ten high-seas MPAs have been created by members of the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) and the North Atlantic Fisheries Commission.[86] These areas are “no-take zones” in which the extraction of marine resources is prohibited for conservation purposes. However, the provisions of high-seas MPAs have not yet been formally incorporated into international law. In 2017, the United Nations General Assembly discussions began to delineate conditions for MPA standards, governance regimes, and environmental impact assessments on the high seas as part of the process of formulating a new international instrument on biodiversity in ABNJs, which is described below.

5.3 Multilateral environmental agreements

The CBD is the comprehensive binding agreement for the conservation of biological diversity worldwide. It governs the sustainable use of biological resources and the equitable sharing of benefits arising from the utilization of genetic resources, including access to genetic resources and relevant technologies. Key CBD targets, protocols, and mandates dealing with marine and coastal resources include: (i) the Jakarta Mandate for the Conservation and Sustainable Use of Marine and Coastal Biological Resources, adopted at the CBD/COP 2 (1995); (ii) the 12 Malawi Principles for the Ecosystem Approach on the Land, Water and Living Resources (CBD/COP4, 1998), which refer specifically to marine and coastal biodiversity; (iii) the Nagoya Protocol,[87] which operationalizes CBD

Articles 1 and 15 on access to genetic resources from terrestrial and marine sources and provides for equitable benefit sharing, though it only covers marine genetic resources within national jurisdictions;[88] and (iv) the 2011-2020 CBD-Strategic Plan and its Aichi targets, specifically targets 3, 6-12, and 16, which relate to marine ecosystems and resources.

The rights and conditions for accessing and using marine genetic resources from international waters have yet to be clarified and further developed. The countries that participated in the 2012 Rio+20 Conference89 recognized "the importance of conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction" and committed to take urgent action, and in 2015 the General Assembly passed a resolution to develop an international legally binding instrument under the United Nations Convention on the Law of the Sea (Resolution UNGA/RES/69/292). During 2016 and 2017, the General Assembly was advised on a draft text of an international legally binding instrument, and key elements identified by member states were consolidated in a working paper. United Nations negotiations for a new legally binding international instrument on biodiversity in ABNJ will start in New York in late 2018. This process is particularly relevant for Blue BioTrade and must be observed closely, especially aspects dealing with genetic resources and bio-chemicals in the development of natural ingredients, as well as research and development R&D activities in the aquaculture, personal care, biotechnology and pharmaceutical sectors.

CITES, also known as the Washington Convention, is a multilateral treaty designed to ensure that sustainable international trade in wild flora and fauna. It regulates trade in species listed in its appendices through a common set of import/export permits. CITES Appendix I identifies threatened species and restricts trade to non-commercial purposes. CITES Appendix II identifies species that are not yet threatened but may become so unless trade is regulated. Trade in these species remains legal, as long as it is sustainable, legal, and traceable, so that "the export of specimens of any such species should be limited in order to maintain that species throughout its range at a level consistent with its role in the ecosystems in which it occurs." Appendix III lists species that are protected in at least one country and requires that other CITES member states assist in controlling the trade in those species. The controls established in CITES Appendix I and II apply to all trade transactions regulated under the Convention, including import, export, re-export and introduction from the sea. Many important marine species are subject to regulated trade under CITES, such as certain sharks, ray, corals, and molluscs that have commercial value (Box 8). As noted in Section I, the set of minimum eligibility requirements for Blue BioTrade stipulates that no activity should negatively affect endangered species, including those listed in CITES Appendix 1. However, BioTrade fosters the sustainable management and trade in species listed in CITES Appendices II and III-listed species and helps ensure that the benefits generated by that trade are shared across all value-chain stakeholders.

The 1971 RAMSAR Convention established a framework for the conservation and sustainable use of wetlands and their resources. including marine and coastal wetlands. Marine wetlands are saltwater wetlands that may encompass coral reefs and aquatic subtidal beds with seagrass and kelp. Coastal wetlands include estuarine lagoons, sand and pebble shores, tidal lagoons, coral riffs, mangrove and tidal marshes, shallow seas, coastal floodplains, and dune swamps. Both marine and coastal wetlands provide important nursery and feeding areas for fish, molluscs, turtles, dugongs and other marine species, and they also provide habitat for migratory water birds. Coastal and marine wetlands are also greatly valued for recreational and tourism activities, and many are important carbon-capture sinks.

The Bonn Convention on Migratory Species (CMS) is an international treaty aimed at protecting terrestrial, marine, and avian species across their migratory ranges. The convention operates under the aegis of the UNEP. It was signed in1979, became effective in 1983, and currently has 120 parties and member states. The CMS and its implementing agreements set policies and provide guidance on specific issues. Blue BioTrade activities targeting migratory marine species should reflect obligations under the CMS as well as the United Nations Fish Stocks Agreement described above.

The 1972 World Heritage Convention is one of the most important international conservation agreements. Its primary mission is to identify and protect the world's natural and cultural heritage by safeguarding places of outstanding universal value. The World Heritage Convention's operational guidelines define the procedures for inscriptions, site protections, danger-listings, and the provision of international assistance through the World Heritage Fund.[90] Being listed as a

Box 8: Case study: Queen conch in the Caribbean

The gastropod mollusc Strombus gigas, known as the queen conch, is one key marine species regulated under CITES in the Caribbean. The regional trade in queen conch meat and shells is especially important in terms of volume, value, and socio-economic significance.[a] The queen conch provides important livelihood opportunities for coastal communities. In the Bahamas alone, domestic consumption of conch was valued at approximately US$6 million per year in 2012, and exports earned more than US$3 million.[b] 70% of queen conch exports are consumed in the United States.[c] The queen conch is also culturally important throughout the region and features in many different Caribbean cuisines.

During the 1970s and 1980s, the queen conch was massively overexploited throughout its range, as harvesters moved from free-diving to collection with scuba gear, which allowed fishers to exploit previously untouched deep-water populations. The loss of seagrass to development may have also contributed to the population's decline. In 1992, queen conch was listed in Appendix II of CITES, and several states imposed a moratorium on harvesting. The conch populations rebounded, and harvesting restarted under carefully regulated management. At the time, most of the 36 Caribbean nations and dependent territories established export quotas, harmonized fishery rules, and strengthened trade controls. To address the issue of traceability, queen conch producer states agreed in 2012 to create an auditable "chain of custody" from catch locations to final destinations, consolidating catch data that had previously been collected from landings and exports.

Continued efforts by led by CITES, national and regional fisheries organizations, and other international institutions have reduced overfishing and ensured the legal and sustainable trade in queen conch. Caribbean states have recognized the importance of joint management efforts, particularly under CITES Decisions 17.285 and 17.289, which implemented the Regional Queen Conch Fisheries Management and Conservation Plan based on a 2010 memorandum of understanding.[d] Regional queen conch production has recovered and is now much better-managed, profitable, and sustainable.

a http://www.fao.org/docrep/006/Y5261E/y5261e07.htm; Last accessed 22 May 2018.
b FAO and Bahamas Dept of Marine Resources. 2016. Fisheries and Aquaculture in the Bahamas: A Review. Available at https://www.bahamas.gov.bs/wps/wcm/connect/e1d636dd-1a9b-4661-9e38-ba9bf546a534/FINAL+Bahamas+Fisheries+%26+Aquaculture+Sector+Review+17Nov16.pdf?MOD=AJPERES; Last accessed 17 May 2018.
c CITES. 2003a. Progress on the implementation of the review of significant trade (phases IV and V). Report to the nineteenth meeting of the CITES Animals Committee. AC19 Doc. 8.3; https://cites.org/sites/default/files/eng/prog/queen_conch/docs/2003%20-%20CITES-TRAFFIC%20Report%20on%20Review%20of%20Significant%20Trade%20%28AC19%20Doc.%208.3.%20Annex%29.pdf; Last accessed 22 May 2018.
d https://cites.org/eng/prog/queen_conch/introduction; Last accessed 17 May 2018.

world heritage site implies conservation obligations, but also offers important tourism opportunities and can create jobs for local communities.

5.4 FAO regulations

The FAO leads a global regulatory effort to combat IUU. The 2009 Port State Measures Agreement and the 2001 International Plan of Action (IPoA) to Prevent, Combat, and Deter IUU Fishing were developed as part of this effort. The first is a binding international treaty under which countries agree to close their ports to illicit fishing products, thereby increasing the risk and cost of IUU fishing. The second defines IUU fishing and lists comprehensive, effective, and transparent measures that nations can take to reduce it. Additional FAO instruments that contribute to the fight against IUU fishing include the Global Record of Fishing Vessels,[91] and the Voluntary Guidelines for Flag State Performance. All products of IUU fishing are, by definition, ineligible for Blue BioTrade. Only legally and sustainably harvested and sourced products with traceable origin are valid inputs in Blue BioTrade value chains.

FAO regulates wild-capture activities through the nonbinding 1995 Code of Conduct for Responsible Fisheries. Its purpose is to develop fisheries that are biologically, technically, economically, socially, environmentally, and commercially sustainable by supporting the creation and adoption of mechanisms to control fishery operations, the development of food-safety and quality systems, the design of measures to mitigate post-harvest losses, and the implementation of plans to combat IUU fishing and protect endangered species. The Code of Conduct addresses the issue of fishery tenure, especially for small-scale fisheries (Art 6.18), and it describes the responsibilities of governments to develop institutional and legal frameworks for the use of coastal resources, taking into account the rights of coastal fishing communities (Art.10.1.3).[92] Due to its focus on sustainability, the Code of Conduct should directly inform Blue BioTrade principles and criteria.

The FAO's 2012 Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forest in the Context of National Food Security further promotes secure tenure rights and equitable access to fisheries as a means of eradicating hunger and poverty, supporting sustainable development, and enhancing environmental quality. The Voluntary Guidelines should inform Blue BioTrade principles regarding respect for actors' rights, tenure security, and use and access to marine resources and knowledge (Annex I). Other relevant nonbinding FAO instruments for marine governance include: the International Guidelines for the Ecolabelling of Fish and fishery Products from Marine Capture Fisheries (2009); the International Guidelines on Deep Sea Fisheries in the High Seas (2009); the International Guidelines on Bycatch Management and Reduction of Discards (2011); the Technical Guidelines on the Precautionary approach to capture fisheries and species introduction (1995). These norms, commitments, and nonbinding agreements provide a foundation for technical guidance on best practices for Blue BioTrade.

5.5 Regional fishery governance

Since the early 1970s, governments and regional multilateral institutions have developed various binding and nonbinding agreements regarding the use and conservation of regional marine environments. Many of these efforts were initiated through the UNEP Regional Seas Programme. Current regional agreements involve about 149 states, though most are limited to their respective areas of national jurisdiction. However, some regional agreements pertain to marine protection on the high seas, particularly high-seas areas adjacent to national jurisdictions. These agreements cover 18 marine regions, and they differ greatly in their extent and characteristics. Most regional agreements do not focus on fisheries management, which is often the purview of regional marine organizations.

Regional marine organizations fall under three categories. Regional seas programs (RSPs) cover 18 marine and coastal regions. Fourteen RSPs have been created by or under the auspices of UNEP, which also administers seven of them. The remaining four are independent. Regional fishery bodies (RFBs) include 21 regional fisheries management organizations, which are empowered to establish legally binding regulations over fisheries, and 41 advisory bodies. RFBs enable governments to work together to manage shared fishery resources, and most are restricted to the jurisdictions of contracting parties. However, regional mechanisms for the Antarctic, the Mediterranean, the North Atlantic, and South Pacific conduct activities exclusively in ABNJs. Finally, the United Nations National Oceanic and Atmospheric Administration (NOAA) administers 64 large marine ecosystem projects, and the Global Environment Facility administers an additional 21. These projects are webs of complementary initiatives designed to implement the ecosystem approach to managing marine and coastal resources. Blue BioTrade activities must reflect all agreements, regulations, policies, stocks assessments, and joint actions under these regional fisheries programme and bodies.

6. BLUE BIOTRADE, STANDARDS, LABELLING, AND CERTIFICATION

In addition to compliance with all relevant national regulations and international agreements, BioTrade should embrace supportive voluntary standards, including the various labelling and certification schemes adopted by countries and private organizations. Both mandatory regulations and voluntary standards are consistent with promoting sustainable production and consumption practices and advancing SDGs 2, 12, and 14. However, voluntary standards should not violate the terms of the WTO's Technical Barriers to Trade (TBT) agreement, which stipulates that standards can contribute to supporting environmental and safety objectives so long as the technical regulations, standards, and testing and certification schemes adopted by governments do not create disguised or unnecessary barriers to trade. The TBT agreement also requires signatories to comply with the Code of Good Practices for the Preparation, Adoption and Application of Standards to ensure that national standards are not used as nontariff trade barriers.

Under the TBT, technical regulations are defined as mandatory requirements for products or related process and production methods, while standards are non-mandatory guidelines provided by a recognized body. Both technical regulations and standards refer not only to the products themselves, but also to terminology, symbols, packaging, marketing and labelling requirements. International trade rules clearly state that some trade restrictions designed to protect species or ecosystems may be permissible, even though they may violate the General Agreement on Tariffs and Trade (GATT) provided they fall within relevant exceptions.[93]

6.1 Standards

The International Standards Organization (ISO) defines standards as documented agreements containing technical specifications or other precise criteria to be used consistently as rules, guidance, or definitions to ensure that materials, products, processes and services are fit for their intended purposes.[94] Standards can pertain to products as well as methods for assessing products, codes of practices, management systems, or best practices. A management system standard describes how a business manages its production process, either for quality-assurance purposes or to address specific concerns such as food safety, environmental stewardship, sustainability, or security of information systems.

Standards perform several functions. They facilitate transactions by providing harmonized and comparable information about goods and services in the marketplace and by facilitating the interoperability and comparability of products and systems. They are also an important vehicle for the diffusion of best practices and improved technologies, and they can provide important political guidance on preferable products and processes. Both mandatory and voluntary standards can become effective tools for ensuring sustainability.

Mandatory standards

All countries establish rules and mechanisms to ensure food safety and prevent the spread of disease among animal and plants, including marine species. These measures apply to both domestically produced products and imports. Under the TBT agreement, mandatory standards applied to imports must not act as restrictions on trade. The WTO's Agreement on Sanitary and Phytosanitary Measures sets out the basic rules for food security and plant and animal health standards. It allows countries to set their own standards, as long as they are based on scientific principles and are not maintained without sufficient scientific evidence. Such standards shall be applied to the extent necessary to protect human, animal or plant life and health without unjustifiably discriminating against countries where similar conditions prevail.

Voluntary standards

Most voluntary standards have been created in industrialized countries and are designed to address consumer concerns about the environmental and social impact of goods and services. Voluntary standards have become tools for differentiating retailers and their products in an increasingly competitive global market. Voluntary standards provide consumers with information that can promote more conscientious purchasing decisions, as well as ensuring product and food safety. Being market-based, they tend to favour the most cost-effective solution and enhance harmonization, interoperability, transparency and traceability throughout the value chain. Voluntary standards can promote investment in sustainable practices, as evidenced by corporate commitments to procure standard-compliant supplies. They can also

help governments implement policy objectives and aid financial institutions in managing risk.

Voluntary standards were originally developed on a national basis, but are now increasingly regional and international. Significant differences between different voluntary-standards regimes can cause confusion among both producers and consumers, undermining their objectives. Moreover, the proliferation of national, regional and international standards can cause market fragmentation and increase costs rather than promoting harmonization and convergence. Export-oriented producers that must split their value chains to introduce products that comply with voluntary standards may be less able to leverage economies of scale. While noncompliance with voluntary standards does not necessarily restrict production or exports, complying with certain standards or labelling may facilitate access to coveted consumer segments or distribution chains.

6.2 Labelling

Labelling products or services can communicate important information to end consumers. Some types of labelling are mandatory—for example, governments often require that food items bear nutrition information on their packaging—but most labelling is voluntary and designed to convey a product's quality and desirability. Labels that describe the environmental impact, ethical production standards, or equitable distribution of revenues for a given product can help businesses appeal to consumers who value these characteristics.

An "ecolabel" is a voluntary label or declaration that provides information about the environmental impact of a product or service in order to influence or inform purchasing decisions. Ecolabels may take the form of a statement, symbol, or graphic placed on products, packaging, or advertising. Ecolabels signify that a product is more environmentally friendly than similar products.[95] While most ecolabels relate to specific environmental or ecological objectives, some also convey information about economic and social goals. For example, "fair trade" labels indicate both environmental responsibility and economic equity. Because ecolabeling schemes can contribute to maintaining the productivity and economic value of marine resources while providing incentives to sustainably manage marine biodiversity, they can play a key role in Blue BioTrade.

There are three categories of voluntary ecolabeling schemes.[96] The first is self-declaration labelling, in which individual companies use labels to describe their self-imposed environmental standards. The second category is labelling developed by industry associations, which define specific criteria for the products of member firms and verify compliance either through internal procedures or via external certification. The third category is labelling by private organizations, which license their labels to producers, while an external certification company verifies compliance.

As a tool of environmental management, ecolabeling is the subject of the ISO 14000 Series. This series does not prescribe environmental performance levels. Instead, standards firms are required to establish environmental policies and to set targets and objectives for environmental management. The ISO 14000 Series identifies three types of ecolabel differentiated by information level. Type I is a multi-attribute label developed by an external third party. It provides the least amount of detail concerning attribute values, and the information it conveys is often condensed into a one-dimensional scoring algorithm. Type II is a self-proclaimed, single-attribute environmental declaration. Type III provides the most detailed information, encompasses several attributes, and is awarded based on a full life-cycle assessment.[97]

In addition, the ISO 14020 Series provides a credible set of international benchmarks against which firms can prepare their environmental labelling. ISO 14021 attempts to harmonize the use of self-declared claims. It prohibits the use of vague claims that imply some unspecified environmental benefit, such as "environmentally friendly," "green," "nature friendly," and "sustainable." The latter is disallowed regardless of the definition of sustainability used, as minimum thresholds for the economic, social, and environmental performance that would universally define sustainable production have yet to be established. The ISO 26000 "Guidance on social responsibility" reinforces this position by barring self-declared claims of sustainability. The ISO 14024 provides the requirements for operating a valid ecolabeling scheme and has been adopted by the Global Ecolabelling Network (GEN) as a benchmark. GEN is a network of ecolabeling organizations in nearly 60 countries. It focuses on the exchange of information between national ecolabel organizations that issue Type 1 ecolabels as defined by ISO 14024.

Voluntary ecolabeling schemes have proliferated in recent decades, and an estimated 465 labelling schemes currently operate in 199 countries across 25 industries.[98] Of these, 147 include standards for food and beverages.[99] The European Union Commission has identified 129 public and private sustainability-related food information schemes in the European Union.[100] These schemes are designed to improve transparency along the food value chain and promote sustainable production and consumption, but some offer weak or unsubstantiated claims and many amount to little more than a self-declaration by individual firms. Consequently, the wide array of ecolabels and similar forms of labelling may not give consumers meaningful guidance in choosing environmentally responsible or ethically sourced products.

Many ecolabels proclaim that labelled products promote sustainability, but each scheme reflects a particular starting point for defining sustainability. Similarly, ecolabels frequently make claims that worst practices have been avoided, but what constitutes worst practices are defined differently by the various environmental organizations or companies that have adopted the label. The International Social and Environmental Accreditation and Labelling (ISEAL) Alliance has attempted to reconcile some of the differences in ecolabeling standards. ISEAL is a global membership association of private organizations with different sustainability-related goals and objectives. Members must adhere to the ISEAL Code of Good Practices. Similarly, the FAO has developed Guidelines for the Ecolabelling of Fish and Fishery Products[101] and Technical Guidelines on Aquaculture Certification[102] to establish basic consistency between voluntary standards and major international agreements by providing a minimum set of substantive criteria for operating credible ecolabeling schemes.[103]

Some ecolabels focus on environmental issues but also include social standards. For example, the Union for Ethical BioTrade (UEBT) labels address biodiversity considerations and social aspects (Box 9).[104] The Social Accountability International Initiative established the SA 8000 to help organizations demonstrate social responsibility along the supply chain. This standard is designed to reflect ethical working conditions, adherence to national labour laws and respect for the Universal Declaration of Human Rights, the ILO conventions, and other international agreements. Some labelling organizations lack the capacity to be all-encompassing or deliberately focus on specific areas. If these organizations conduct impact reports—which more and more are doing, especially those that are ISEAL compliant—then they should clearly indicate which aspects of sustainability are being addressed.

The proliferation of numerous, unreliable systems for ecolabelling is eroding consumer confidence, and firms often have difficulty selecting an ecolabel that effectively conveys their commitment to ethical sourcing.[105] Worldwide ISO surveys have shown that ecolabels are often scientifically inaccurate and/or difficult to understand.[106] The lack of consistent standards for ecological sustainability, social responsibility and economic equity and the tendency of ecolabels to present misleading information undermine their core function of correcting market information asymmetry. These critical shortcomings

Box 9: The Union for Ethical BioTrade and the Ethical BioTrade Standard

The Union for Ethical BioTrade (UEBT) is a spin off organization of UNCTAD's BioTrade Intiative, which promotes the "Sourcing with Respect" of inputs derived from biodiversity. The UEBT is a membership-based non-profit association launched in 2007. It created the seven principles of the Ethical BioTrade Standard, which members use to guide practices for the sourcing of natural inputs in a manner consistent with sustainable business growth, local development, and biodiversity conservation.[a] The standard only applies to goods, either wild or cultivated, and does not cover services. As it based on the BioTrade principles listed above, the (2012) Union of Ethical BioTrade Standard focuses on terrestrial resources and ecosystems, and it does not necessarily reflect the unique characteristics of marine and coastal resources and ecosystems.

a Olivia (2011). Sharing the benefits of biodiversity: A new international protocol and its implications for research and development.

Source: Union for Ethical BioTrade, http://ethicalbiotrade.org/about-the-union/.

can be addressed by defining universal Blue BioTrade principles and criteria that can serve as a basis for accurate and comprehensive ecolabeling.

Ecolabel certification

Ecolabel certification is a process through which a third party provides written assurance that a product, process, or service conforms to a set of defined standards. Certification helps ensure that ecolabels accurately convey information to consumers, but the certification process can be costly and may not be justified by price premiums for ecolabelled products.[107] In the European Union, the cost of an ecolabel application fee ranges from €200 to €1,200, and annual fees can be as high as €1,500.[108] In the Netherlands, the cost of ecolabel certification includes both a one-time certification fee of US$800 and an annual fee of between US$600 and US$39,000.[109] In China, the total fee for obtaining ecolabel certification ranges from US$1,800 to US$6,000.[110] For firms in developing countries that lack certification bodies, these costs can increase significantly.

The number of voluntary eco-labelling schemes specifically for seafood products has increased significantly in recent years.[111] Examples include the Marine Stewardship Council (MSC), the Aquaculture Stewardship Council, Friends of the Sea, Friends of the Fish, Wild Generic Sustainability Standards, Global Aquaculture Alliance, GLOBAL G.A.P Aquaculture, Naturland Sustainable Capture Fishery, Fair Trade for Small Farms and Facilities, and the International Federation of Organic Agriculture Movements (IFOAM). The scope of marine and fishery labels is relatively broad, ranging from those that guarantee safety for wild species to those that address over fishing, bycatch, destructive fishing practices, IUU fishing, discards, ghost fishing, ecosystem deterioration, and damage to the food chain. The Global Sustainable Seafood Initiative (GSSI)[112] has attempted to standardise the criteria on which these certification schemes are based. The consumer market drives demand for marine ecolabeling certification, and voluntary ecolabeling schemes for certified seafood do not appear to contravene multilateral trade rules, though voluntary standards can create barriers to trade for less-developed countries and small producers.

The MSC was established by Unilever and the WWF in 1997. It defines principles, criteria, and processes for third-party certification of fisheries. The MSC standards are based on three core principles: (i) fishing practices must be sustainable for the targeted fish population and avoid overexploitation; (ii) fishing practices must maintain the structure, productivity, functions, and diversity of the ecosystem on which the fishery depends; and (iii) fishery management must meet all local, national, and international regulations, and a data-collection system must be in place to monitor and respond to changing circumstances to maintain sustainability. Under these three principles are 31 performance indicators, against which activities are assessed for certification. The MSC is compliant with the FAO Guidelines for the Eco-labelling of Fish and Fishery Products from Marine Capture Fisheries and is consistent with the ISEAL Alliance Code of Good Practices on Standard Setting and Impact Monitoring. The MSC also establishes a Chain of Custody Standard for Traceability. For seafood to be sold with the MSC ecolabel, every activity in the value chain must be assessed and certified by an independent body to ensure that it conforms to the MSC Chain of Custody Standard.

Most MSC-certified products originate from large-scale marine fisheries, including salmon, prime white fish such as cod and pollock, and spiny lobster. Although developing countries account for more than 70% of total marine capture fishing, these countries contribute less than 3% of total MSC-certified tonnage. Germany, the Netherlands, the United States, the United Kingdom, Sweden, and Switzerland supply two-thirds of MSC-certified products. MSC is making an effort to expand its focus on fisheries in developing countries and emerging economies, especially areas facing acute threats to biodiversity.[113] However, the cost of MSC certification is too high for many small scale and artisanal fisheries to bear.

The costs of certification can vary greatly depending on the certification scheme, the size and complexity of the fishery, and the time involved in the certification process. The availability of reliable scientific data can also affect certification. The costs of the certification process are paid to the independent third-party certification body, and the main cost components are fishery pre-assessment, assessment, and re-assessment, and, in the case of MSC certification, chain-of-custody assessment. An additional license fee for the use of the label or logo is paid directly to the labelling organization. Certification by an independent accredited contractor costs between US$15,000 and US$120,000.[114] After certification, fisheries undergo annual auditing, which costs US$75,000 per audit,

and the fishery must be re-certified every five years.[115] The total assessment costs for MSC certification can range from US$10,000 for a small, simple fishery to more than US$250,000 for a large, complex fishery.[116] For example, an Alaska pollock fishery took four years to become fully certified at a total cost of US$500,000.

Though MSC standards overlap with BioTrade principles, some aspects of Blue BioTrade are not covered by the MSC standard and vice versa. The MSC standard focuses on minimizing environmental impact, but it does not demand a management process that guarantees ecosystem sustainability. Instead, the key sustainability indicator is the MSY of the targeted stock. Moreover, the MSC standard has no bearing on socioeconomic sustainability or benefit sharing. The MSC process is largely designed for industrial fishing and does not address tenure or other issues of importance to smaller community and artisanal fisheries. Finally, the MSC, like most eco-labels, does not take a holistic approach to ecosystem management, nor does it apply to every level of the value chain.

Another seafood certification scheme is the GSSI Global Benchmark Tool (GSSI GBT), which is grounded in the FAO Guidelines for Eco-labelling of Fish and Fishery Products, the FAO Code of Conduct for Responsible Fisheries, and the FAO Technical Guidelines for Aquaculture Certifications. The GSSI GBT also follows the ISO normative standards and complies with ISEAL codes. The GSSI GBT has four components: (i) seafood certification scheme governance; (ii) seafood certification scheme operational management; (iii) aquaculture certification standards; and (iv) fisheries certification standards.[117]

The Friends of the Sea organization certifies both wild and farmed fish products. Its main criteria are: (i) avoiding overexploitation of target stocks; (ii) limiting discards to a maximum of 8%; (iii) avoiding bycatch of endangered species; (iv) avoiding adverse impacts on the seabed; and (v) ensuring compliance with IUU, Total Allowable Catch (TAC), and other regulations. Friends of the Sea claim to cover over 10% of global wild-capture fisheries, but 80% of their certified products come from Peruvian anchovy fisheries. The annual fee to use the Friends of the Sea logo is US$4,200.

Most seafood labels are resource-based rather than processed-oriented. Most scoring criteria address the status of the resource (e.g. current level of stocks) and the characteristics of the fisheries (e.g. type of fishing gear used), but seafood labels rarely evaluate the effectiveness of national fishery-management systems. Consequently, the presence of labelling schemes does not necessarily imply sustainable practices at the national level.[118]

Certifications are becoming increasingly popular in aquaculture, reflecting a shift in the focus of consumer demand for sustainability. For decades, the major concern has been the maintenance of wild fish stock levels, and certification has largely focused on capture fish such as cod, salmon, anchoveta, and tuna. Yet while 80% of certified seafood is wild catch, the amount of certified seafood from aquaculture is growing at a rate of 76% per year. The most common aquaculture certification schemes are operated by the Aquaculture Stewardship Council, the Global Aquaculture Alliance (GAA), the Naturland Sustainable Capture Fishery, and IFOAM. The GAA promotes aquaculture as a sustainable means to increase the seafood supply, though this assumption is controversial. The GAA has created a Best Aquaculture Practices certification standard, which defines the main elements of responsible aquaculture. Existing aquaculture certification schemes could be enhanced by the application of Blue BioTrade principles for aquaculture.

By 2015, certified seafood production had increased to 23 million metric tons, or 14% of global seafood production,[119] with an estimated retail value of US$11.5 billion.[120] However, certification remains limited to certain segments of the producer market, especially fisheries in developed countries with substantial management capacity, as well as high-profile, high-value species that represent less than 20% of global marine fishery production. Most seafood labels are tailored to specific supply chains and regions, particularly consumer markets in developed countries, and certification in developing countries is largely restricted to easily certifiable fisheries. The rapid increase in the number of private certified schemes of the last 15 years has raised applications costs and increased confusion along the seafood value chain.[121] In response to this problem, some governments have created public certified schemes such as Iceland's Responsible Fisheries and Japan's Marine Eco-label.

Mislabelling and fraudulent labelling and certification is a growing problem. Currently, an estimated 20%[122] to 48%[123] of all certified seafood products are mislabelled. The United States Food and Drug Administration has reported that during 2011-13, an estimated 15% of wholesale seafood products were mislabelled.[124]

Other sources report that between 2015 and 2016, about 82% of grouper, perch and swordfish tested in Italy, 50% of sole tested in Germany, 98% of bluefin tuna tested in Belgium, and 63% of pacific red snapper tested in California were mislabelled[125]. Even certified seafood labelling schemes are not immune to errors and fraud, and a substantial amount of MSC-certified Chilean seabass has been found to be mislabelled.[126]

Most fisheries standards focus on environmental management and do not consider social-responsibility issues such as non-discrimination, human rights, or workers' health and safety. These issues cannot be easily monitored in wild-capture operations due to the challenges of observing conditions and verifying compliance aboard fishing vessels. However, aquaculture standards such as Naturland, IFOAM and GAA can effectively address some social issues.[127] The UNCTAD BioTrade initiative is currently working with the International Trade Centre (ITC) to include BioTrade within its Standards Map and identify which standards directly support the economic, social and environmental objectives of BioTrade. Blue BioTrade can provide a more holistic alternative to existing standards and ecolabeling schemes, as its environmental, social, and economic principles span the value chain and encompass both the ecosystem-services and adaptive-management approaches.

Traceability

Increasing media coverage of the environmental social, legal, and economic issues associated with seafood production has intensified incentives to ensure that producers adhere to both mandatory regulations and voluntary standards. However, the complexity of identifying an ocean-based product's origin, attributes, safety, and progress along the supply chain poses a persistent challenge. In the past, food safety was the primary focus of industry traceability, and only in the past decade has traceability become an important issue affecting the credibility of the entire supply chain.

The Codex Alimentarius defines traceability as "the ability to follow the movement of a food through specified stages of production, processing and distribution." The European Union Regulation 178/2002 defines traceability as the ability to trace and follow food, feed, food-producing animals, or ingredients through all stages of production, processing and distribution. A more generic definition of traceability is "the ability to access any or all information relating to that which is under consideration, throughout its entire life cycle, by means of recorded identifications."[128] Traceability is a complex issue requiring proper documentation and recordkeeping as well as the observation of proper handling protocols during processing, shipping, distribution, and sales to ensure that a product can be accurately tracked from its source to its destination. Traceability is included in the import regulations of major seafood importers and is a core component of many voluntary ecolabeling schemes.

Traceability is also an important component of Blue BioTrade, with key implications for the quality and safety of both food and non-food products sourced from coastal and marine environments. Traceabilty is relevant to consumers, as it strenghtens brand confidence and reinforces the integrity of labelling and certification schemes, and it is relevant to business owners, as traceability contributes to risk mitigation and reduces liability costs. Adopting a value-chain approach to traceability allows firms to identify areas for productivity gains and managerial improvements, enhancing the efficiency of the value chain, reducing errors, and strengthening monitoring and control of fish stocks. Traceability is also essential to comply with national and international regulations and standards, including voluntary certification, and it increases transparency and promotes corporate integrity. For these reasons, traceability needs to be a key element of Blue BioTrade principles and criteria.

Tourism standards and labels

Sustainability is among the most important issues facing the global tourism industry. Tourism depends on maintaining high-quality natural and manmade environments, and both ecological degradation and socioeconomic inequity pose both direct and reputational risks. Sustainable tourism requires the active participation of local communties and other stakeholdrs, as well as equitable benefit sharing. Shared benefits from tourism include economic returns and improvements in quality of life via investment in infrastructure and social services. By maintaining a consistent level of service quality and ensuring a minimum degree of ethical integrity, sustainable tourism can enhance the visitors' experience. Much like the labelling and certification schemes described above, establishing a set of standards for responsible tourism can leverage domestic and international demand for sustainable practices, while also promoting competion within the industry.

The Global Code of Ethics for Tourism, adopted in 1999 by the General Assembly of the UNWTO, establishes

basic principles for setting of responsible tourism standards. The Global Code of Ethics for Tourism is a voluntary mechanism designed to guide decisions by private stakeholders. Similarly, the 2005 Principles for Implementation of Sustainable Tourism, developed by UNEP, provides a nonbinding framework for creating sustainable tourism standards.[129]

Like fisheries and aquaculture, the tourism industry has embraced ecolabeling. Tourism industry ecolabels address the ecological footprint of tourism infrastructure, the environmental impact of tourism operations, and in some cases they reflect the industry's consistency with the carrying capacities of sensitive ecosystems. For example, the Green Globe ecolabel scheme assesses the sustainability of travel and tourism businesses and their supply-chain partners. The Green Globe Standard includes 44 core criteria and over 380 compliance indicators, and compliance is verified twice per year. Dozens of international and national certification schemes and associated labels can be applied to tourism operators and destinations,[130] which demonstrates the need for a common set of criteria, as the proliferation of voluntary standards and certification programs can dilute their impact on sustainability.

Most tourism standards set requirements for accommodations, but few apply to tour operators or other service providers, and they rarely focus on ecosystem mangement or biodiversity conservation. For example, of the approximately 40 standards devised by the ISO Committee on Tourism and Related Services (TC228), none impose ecosystem management or biodiversity conservation standards for accommodations, harbour services (see, e.g., ISO/AWI21406), or the training of scuba divers and other service providers. The only reference to the natural environment is found in the ISO 18065:2015 standard, which establishes requirements for tourist services provided directly by the Natural Protected Areas Authority (NPAA).[131] This standard does not apply to private operators.

One of the most widely used tourism ecolabels is the "Blue Flag" for beaches. The Blue Flag began as a tool to enforce the European Bathing Water Directive, but it has since been adopted in more than 3,200 beaches in Europe, Canada, the Caribbean, New Zealand, and South Africa. National authorities in Croatia, Tunisia, Estonia, Sweden, the United Kingdom and elsewhere also apply tourism standards with associated labels or other forms of marketing. For example, the government of Ecuador applies the "*Calidad Galapagos*" standard to support sustainable tourism in the Galapagos Islands.[132] However, as with fisheries labelling, worldwide surveys have shown that tourism ecolabels are often scientifically inaccurate or difficult to understand, underscoring the importance of developing common principles and criteria for sustainable coastal and marine tourism.[133] Responsible tourism standards should also attempt to build local capacity to manage sensitive ecosystems and reduce manmade pressures on natural resources.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 The future of the ocean economy

The vastness of the world's oceans has made them appear to be limitless source of commodities, food, minerals, energy, ecosystem services, genetic resources, and other materials, as well as an inexhaustible meduim for transportation, recreation, and cultural activities. The challenges associated with monitoring ocean use, combined with the common-pool nature of most marine and coastal resources, has contributed to unsustainable overexploitation. The pressure on oceanic resources is compounded by a growing population, an expanding range of marine-based economic activities, increased pollution levels, and the complex impacts of climate change.

The adoption and implementation of UNCLOS represents a major step toward properly defining the ocean economy and measuring the value of its contribution to global prosperity. The current lack of internationally accepted definitions, classifications, and terminology has created multiple conflicting perspectives and conclusions regarding the scope and importance of coastal and marine-based sectors. The links between biodiversity, ecosystem services, and economic output vary between and within sectors and across global regions and value chains. Accurately understanding the value of ocean-based biological resources is equally vital to environmental conservation, social equity, and economic efficiency. Official statistics and national accounting data rarely capture the benefits that marine ecosystems provide to the wellbeing of local communities, while firms and consumers tend to underestimate the value of biodiversity and ecosystem services, which is external to market transactions. Protecting biodiversity and sustaining ecosystem services falls under the purview of a public sector that often lacks the capacity, understanding, or political will to safeguard these critical forms of natural capital.

Explicitly accounting for the benefits to human welfare provided by healthy ecosystems is the first step in developing effective strategies to protect the integrity and growth potential of the ocean economy.[134]. The next step is to design and adopt principles and criteria to guide existing and emerging sectors toward sustainability. This report is designed to provide the analytical foundation for developing those principles and criteria under the rubric of Blue BioTrade. UNCTAD is well positioned to lead the process of creating a shared concept of Blue BioTrade and implementing its standards in priority value chains to maximize the benefits of trade from ocean-based economic sectors.

7.2 The role of Blue BioTrade

This report has presented a proposed definition, scope, and set of principles and criteria for Blue BioTrade. Blue BioTrade is defined as the ecologically sustainable and economically equitable use of, and trade in, coastal and marine biodiversity, including species, genetic resources, and ecosystems. The category is restricted to living organisms and the products of living organisms, and it excludes the exploitation of minerals or other inorganic resources. The report identifies four priority Blue BioTrade sectors: (i) fisheries and aquaculture, (ii) bioprospecting for natural marine compounds, (iii) coastal and marine-based tourism, and (iv) investments in carbon capture and sequestration.

Blue BioTrade is an innovative tool for achieving sustainability, and its implementation would directly contribute to the achievement of United Nations SDGs 2, 12, and 14. UNCTAD has the capacity to spearhead further discussion, testing, and revision of the Blue BioTrade principles and criteria in collaboration with institutional partners and other stakeholders. Adapting traditional BioTrade principles and criteria to the ocean economy will contribute to a greater understanding of the sustainable use of coastal and marine biodiversity, the expansion of equitable access rights and benefit-sharing principles in the marine environment, and more thorough compliance with the national and international regulatory frameworks, voluntary standards, and traceability requirements. In this context, Blue BioTrade can play a critical role in ensuring the sustainable use of marine and coastal resources.

Blue BioTrade principles and criteria must account for: (i) the complex ecological dynamics of coastal and marine ecosystems, including their permeability and interdependence and the prevalence of migratory species; (ii) the inherent need for international collaboration to sustainably manage the ocean economy; and (iii) differences in the institutional capacity, regulatory frameworks, and political economy of coastal nations. Consequently, Blue BioTrade must

be adaptive and implemented through a precautionary approach, with tools and methodologies tailored to each situation.

Due to the complexity of marine ecosystems, the traditional concept of MSY for individual species should be re-examined from the perspective of the ecosystem as a whole. As it is currently understood, the concept of MSY may be fully consistent with maximizing ecosystem benefits via the value-chain approach. In sectors that use but do not consume biological resources, such as tourism or marine bioprospecting, impact assessments should be conducted to estimate ecosystem effects and trade-offs.

UNCTAD and CAF are well equipped to support the development of a methodology backed by sound scientific evidence to assist firms in implementing Blue BioTrade principles and criteria. UNCTAD and CAF can also aid governments in designing supportive policies and targeted economic incentives to facilitate the adoption of Blue BioTrade. Coordinated action across levels of government will be necessary to promote community-based management and sustainable businesses practices. Enabling coastal and marine communities to select Blue BioTrade and take a lead role in its implementation will strengthen local ownership. UNCTAD, CAF, and their national, regional, and international partners can provide programmatic support at the country, value-chain, and sector levels, while monitoring and evaluating Blue BioTrade and sharing lessons learned.

7.3 Next steps for Blue BioTrade

The proposed definition and scope of Blue BioTrade and the draft principles and criteria presented in Annex I should be discussed and piloted under the guidance of UNCTAD and CAF. UNCTAD and CAF should work in close collaboration with key stakeholders, including the CBD and CITES secretariats, as well as other international, regional, and national organizations, governments, firms, industry associations, academic institutions, development agencies, and civil society groups (e.g. the International Oceans Institute) to design and implement Blue BioTrade. CAF and other regional financial institutions should provide project financing and guidance on best practices for marine and coastal businesses.

The development of Blue BioTrade is timely, as UNCTAD and its partners are currently launching a worldwide revision process to update the 2007 BioTrade Principles and Criteria based on the lessons learned during the past 10 years. Completing the definition of Blue BioTrade principles and criteria and facilitating their widespread adoption will require: (i) consultations with partners and key experts on the draft Blue BioTrade principles and criteria presented in Annex I; (ii) piloting Blue BioTrade principles and criteria in a range of real-world contexts; (iii) expanding the existing BioTrade network to include organisations acting in the coastal and marine environment; (iv) revising and updating Blue BioTrade principles and criteria based on stakeholder input; (v) developing tools and methodologies to ensure that Blue BioTrade principles and criteria are based on sound scientific data and input from the private sector; and (vi) providing programmatic support, both at the country level and within segments of the value chain, that reflects the unique features of coastal and marine ecosystems, the economic dynamics of ocean-based sectors, and the maritime regulatory framework. Establishing a consensus as to what constitutes Blue BioTrade and developing corresponding guidance for both producers and consumers could greatly enhance the environmental and economic sustainability of the ocean economy.

ANNEX. DRAFT BLUE BIOTRADE PRINCIPLES AND CRITERIA

The following Blue BioTrade principles and criteria apply to living coastal and marine resources and ecosystems, including genetic resources, plants, animals, other organisms and products derived therefrom. Their purpose is to promote the sustainable use of, and trade in, coastal and marine resources. Blue BioTrade focuses on, but is not restricted to, (i) fisheries and aquaculture; (ii) bioprospecting for natural marine compounds; (iii) coastal and marine tourism; and (iv) carbon capture and sequestration. These draft principles and criteria are intended to generate discussion among stakeholders in the public, private, and non-profit sectors.[135] The principles and criteria listed below were prepared by a team of experts and vetted by a peer-review process.

To be considered Blue BioTrade, all activities related to coastal and marine resource harvesting/catching, processing, transportation, and commercialization, as well as the delivery of coastal and marine resource-based services, should comply with a minimum set of eligibility requirements.

Blue BioTrade: Minimum Eligibility Requirements

- The activity focuses on material derived from **coastal and marine biodiversity** (e.g. living coastal and marine species).
- The activity **does not include the extraction of minerals,** such as sands, metals, oil and gas, or the generation of energy;
- The activity **does not seek to use or develop genetically modified organisms;**
- The activity **does not use or foster the use of invasive species**;
- The activity **does not harvest/catch, use, disrupt, or otherwise threaten endangered species**, including those covered in CITES Appendix I and in national and regional endangered-species lists;
- The activity does not contribute to the **degradation or transformation of marine and coastal ecosystems**, such as the draining of wetlands or the deforestation of coastal areas;
- The activity does not incorporate or directly support any form of illegal, unreported, and unregulated (IUU) fishing or other illegal activity;[136] and
- The activity must **apply the precautionary approach,** as defined in the Rio Principles and the United Nations Fish Stocks Agreement (1995), *inter alia*[137].

Principle 1. Conservation of coastal and marine biodiversity

In line with SDG 14, the first objective of the CBD, and the Aichi targets related to marine resources and ecosystems under the UNCLOS and multilateral trade frameworks, Blue BioTrade should help maintain coastal and marine biodiversity at the genetic, species, and ecosystem levels.

Criterion 1.1. The characteristics of coastal and marine ecosystems and natural habitats of managed species should be maintained. Blue BioTrade activities should help ensure that the capacity of ecosystems to provide services is maintained at a sustainable level and avoid degradation, fragmentation, or erosion. This is especially important in the case of marine ecosystems, which are highly interdependent and permeable.

Criterion 1.2. Genetic variability of coastal and marine species, including plants, animals, and micro-organisms, should be restored, maintained or increased.

Criterion 1.3. Ecological processes should be conserved. Ecosystem interactions, functions, and biological and chemical cycles may affect the productivity of coastal and marine species and the supply of ecosystem services. Blue BioTrade activities should not adversely affect water quality, oxygen level, acidity, or other conditions necessary to sustain a balanced ecosystem and marine life.

Criterion 1.4. Conservation activities should be planned and implemented in accordance with management plans and conservations measures. Blue BioTrade activities should adopt the precautionary and adaptive-management approaches and use the best scientific evidence available for marine resource assessments, conservation planning or other tools. Conservation activities shall be a coordinated effort by relevant national, regional and international authorities and stakeholders.

Criterion 1.5. Conservation activities should be compiled, and information disseminated to all stakeholders to increase knowledge about coastal and marine biodiversity conservation. BioTrade organizations should contribute to further

development and the transfer of knowledge, as well as management practices and tools developed.

Principle 2. Sustainable use of coastal and marine biodiversity

In line with SDG 14, the second objective of the CBD, and relevant Aichi targets and Post-Aichi Global Biodiversity Targets, Blue BioTrade shall sustainably use coastal and marine biodiversity without significant adverse impacts on vulnerable species and ecosystems. For example, wild-capture fishing, controlled aquaculture, the sampling of genetic resources, and tourism development, should minimise impact on marine life and not interfere with the delivery of ecosystem services.

Criterion 2.1. The use of coastal and marine resources and ecosystems should be planned and managed to ensure their long-term health, productivity, and sustainability. The use of coastal and marine resources and ecosystems should not exceed their maximum sustainable yield or regenerative capacity. Deleterious practices such as overfishing should be avoided, and incident catch, and discards minimized. The extraction of coral, sponges and other sedentary species should only be done in accordance with best practices and in strict compliance with national, regional, and international regulations. Blue BioTrade organizations should implement adaptive, ecosystem-based approaches to planning, stocks management, and monitoring and evaluation, grounded in scientific and empirical analysis.

Criterion 2.2. All actors in the value chains should comply with applicable technical and phytosanitary (e.g. such as health, safety, and environmental) measures and standards for products and services derived from marine and coastal resources.

Criterion 2.3. Aquaculture operations should contribute to the sustainable use of coastal and marine resources and, wherever possible, support the regeneration of damaged or polluted ecosystems. Blue BioTrade aquaculture should avoid the excessive or harmful use of antibiotics, fungicides, or chemical inputs. It should minimize waste, promote recycling, mitigate any potential negative environmental externalities over species, water quality, and promote healthy coastal and marine ecosystems.

Criterion 2.4. The use of ecosystem services should not hinder the continuous generation of those services or damage their regenerative capacity. Tourism and other non-consumptive uses of coastal and marine resources should carefully manage human interactions with wildlife and avoid disturbing species and ecosystems.

Principle 3. Fair and equitable sharing of benefits derived from the use of coastal and marine biodiversity

In line with Articles 1 and 15 of the CBD and the Nagoya Protocol on Access and Benefit Sharing, Blue BioTrade shall ensure that all participants in the value chain are adequately compensated and that access to biological resources is not unduly restricted. Benefit-sharing principles apply to benefits derived from the use and marketing of genetic resources and their biochemical compositions. It may also apply to biological resources, biochemical compounds, and their subsequent applications depending on the national regulations.

Criterion 3.1. Actors along the entire value chain should be able to communicate and interact with one another. Open communication enables actors to better assess the value they add, which contributes to well informed and balanced negotiations.

Criterion 3.2. Value is added, and income is generated at all levels of the value chain. Value and income should be generated and distributed under transparent and equal conditions, based on real cost calculations, and reflecting the value added of each actor.

Criterion 3.3. Information about potential and target markets should be made available to all actors in the value chain. Access to information is essential to identify market opportunities and secure benefit sharing.

Criterion 3.4 R&D on genetic resources, their biochemical compositions and subsequent applications within national jurisdictions and their commercial exploitation shall be based on prior informed consent and mutually agreed terms. Such an activity shall be also consistent with national regulations and obligations under the CBD and the Nagoya Protocol. R&D activities involving coastal and marine biodiversity should be

consistent with UNCLOS obligations for conservation and scientific research, as well as any subsequent conventions (especially in Areas Beyond National Jurisdiction). Blue BioTrade should facilitate coastal and marine research and technology transfer in line with the Nagoya Protocol and national access and benefit-sharing legislation.

Principle 4. Socioeconomic sustainability

Blue BioTrade activities should be economically sustainable and competitive over the long term and foster the engagement and participation of all the value chain actors. They should not be reliant on public subsidies or assistance from non-profits, and they should generate a return that is consistent with market demand and standards.

Criterion 4.1. Organisations should demonstrate sound management capacity. Blue BioTrade organisations should employ appropriate coordination mechanisms and implement strategies designed to ensure long-term financial and economic sustainability. Each organization should set measurable goals and targets to be regularly monitored.

Criterion 4.2. Potential markets should be identified, and competitive advantages consolidated. Blue BioTrade products or services should target specific consumer segments according to a well-developed marketing and export plan. The specific needs for the product or service (market creation) in terms of trade tools, information, strategic partnerships and advertising should be considered. All BioTrade activities should consider the need to involve and support access to markets for the produce generated by small scale and artisanal collectors, harvesters and fish folks.

Criterion 4.3. Organisations should be financially profitable and solvent over the long term. Blue BioTrade activities should be economically competitive and should not require indefinite financial support from governments or non-profits.

Criterion 4.4. Organisations should contribute to local employment and support sustainable improvements in the quality of life in local communities. Blue BioTrade organizations should generate income and promote the welfare of local communities by supporting livelihoods, food security, gender equality, and health and safety.

Criterion 4.5. Negative impacts on local productive and cultural practices should be prevented or minimized. The development of commercial linkages to markets may disrupt the customs of the community or upset the equilibrium of the local market. Blue BioTrade organizations should acknowledge responsibility for adverse or disruptive impacts on local communities and take appropriate action to mitigate them.

Principle 5. Compliance with national and international regulations

Compliance with relevant legislation and regulations is fundamental for the legitimacy of an organization and to access markets. The international framework for ocean governance includes binding multilateral and regional conventions and agreements and non-binding codes of conduct and guidelines, as well as national and local regulations. No aspect of Blue BioTrade should contravene these rules, and Blue BioTrade should not directly or indirectly support, facilitate, or encourage any form of illegal activity.

Criterion 5.1. All activities should exercise due diligence and comply with national and local legislation related to the sustainable capture, harvesting, use of, and trade in, goods and services derived from coastal and marine biodiversity. Blue BioTrade organizations should respect national and local laws and ordinances pertaining to fishing, aquaculture, bioprospecting, tourism, carbon capture, or other relevant sectors. Blue BioTrade organizations also should respect the authority of national and local government's over marine and coastal spatial planning.

Criterion 5.2. All activities should exercise due diligence and comply with international and regional regulations related to the sustainable capture, harvesting, use of, and trade in, goods and services derived from coastal and marine biodiversity. Applicable regulations include, but are not restricted to, UNCLOS, the United Nations Fish Stocks Agreement, the CBD and the Nagoya Protocol, CITES, the Ramsar and Bonn Conventions, relevant treaties and nonbinding guidelines issued by the FAO, the WTO and UNCTAD Agreements, and the conventions and standards of the ILO. Moreover, BioTrade activities should conform to all regulations adopted by relevant RFMOs or other regional bodies.

Principle 6. Respect for the rights of actors involved in Blue BioTrade

The generation of social capital is one of the pillars of sustainable development as well as in BioTrade activities. Respect for the rights of all actors that interact with the organization is fundamental.

Criterion 6.1 Human rights and gender equality shall be respected. Human rights are fundamental to the work of all those involved in the sustainable trade of biodiversity products and services. Similarly, gender equality should be respected and mainstreamed into BioTrade activities. Both issues should therefore be duly recognized and respected.

Criterion 6.2 Intellectual property rights and traditional knowledge shall be respected regardless of their legal status. Blue BioTrade organisations should disclose the origin, source and legal provenance of all genetic/biological resources and prior-art knowledge used when making patent or breeders' rights applications. Access to and use of traditional knowledge should be granted only where prior informed consent has been granted. Traditional knowledge should be regarded as a *sui generic* form of intellectual property, regardless of whether national laws define it as such, and compensation for the use of traditional knowledge should reflect its value._

Criterion 6.3. **Organisations should provide adequate working conditions in line with national labour laws and international conventions on workers' rights and job safety**. Blue BioTrade organisations should minimise the risk inherent in professions linked to the capture and harvesting of marine resources and respect the authority of States over labour rights on vessels under their state flag.

Principle 7. Clarity about tenure rights, use and access to coastal and marine resources

Use of coastal and marine resources takes place under a great diversity of locally defined, informal, exclusive communal relatively closed tenure arrangements, frequently labeled as sea tenure or customary marine tenure. Clarity about rights of access is a very important element in the responsible management of BioTrade operations. Responsibilities of each actor in the management of the species and ecosystems should be defined.

Criterion 7.1. Organisations should respect existing tenure rights. Blue BioTrade organizations should recognize coastal and marine tenure rights in line with relevant regulations and under the authority of competent national institutions. Traditional and community-based tenure rights should be respected, and co-management arrangements with coastal, local and indigenous communities, the private sector, and the government should be used to clarify, formalize, and seek to enforce such tenure rights.

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82 All these UNCLOS measures shall also be designed to maintain or restore populations of harvested species at levels to support MSY. The concept of MSY is introduced in UNCLOS as the international minimum standard for stock rebuilding strategies in fisheries management. The importance of living marine resources for fishing, coastal communities and the economy of coastal states is emphasized. Part XII concerns the Protection and Preservation of the Marine Environment; Art.192 to 195 deal with pollution, and Art. 196 deals with the negative impacts of technologies and the introduction of alien species. The articles also refer to licensing, seasonality and the age and size of resources to be exploited. Also relevant are articles 116 to 120 of Part VII Section 2 on the Conservation and Management of the Living Resources and Marine Mammals in the High Seas. Art 119 deals with the maintenance and restoration of population of harvested species and the MSY concept.

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135 The use of the term 'organization' is used throughout this document to refer to all entities involved in BioTrade activities of production/harvest/catching, transformation or commercialization (adapted from UNCTAD, 2007).

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137 Article 6.1 and 2 of the United Nations Fish Stocks Agreement indicates "States shall apply the precautionary approach widely to conservation, management and exploitation of straddling fish stocks and highly migratory fish stocks in order to protect the living marine resources and preserve the marine environment (…).The absence of adequate scientific information shall not be used as a reason for postponing or failing to take conservation and management measures."