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**“BLUE ECONOMY, A FRAMEWORK FOR
SUSTAINABLE DEVELOPMENT”**

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ABSTRACT

This dissertation is a study of the potentials of the Blue Economy and how they could be harnessed for achieving sustainable development. The report provides a critical bibliographic review, and the methodology followed in the dissertation is based on research of International Organizations, scientists' official references, and the published legislative framework.

Traditionally, the ocean economy is viewed solely as a mechanism for economic development. Under this approach, the ocean economy has developed by exploiting marine and maritime resources, often without considering how these activities affect the future health or productivity of the same resources. There is a need for sustainable exploitation of ocean resources and the protection of marine biodiversity. The rising importance of ocean-based resources has resulted in the emergence of the term Blue Economy. Blue Economy is an evolving concept that calls for better stewardship of our oceanic resources. It includes a range of economic sectors and related policies that together determine whether the use of marine resources is sustainable. Many policies have been ratified to see how the blue economy could be harnessed sustainably since oceans that cover over two-thirds of the earth's surface significantly contribute to poverty abolition in generating sustainable livelihoods.

The study begins with a brief explanation of the reasons oceans are important for humankind and life on earth. The economic attribute of the oceans is presented as well as the challenges they face. Furthermore, it analyzes the relevant international legal and institutional frameworks for ocean governance regimes.

Following, the historical background of the blue economy is presented. Also, the evolution of the blue economy is examined by discussing other related concepts such as the green economy, maritime and ocean economy, and blue growth as it is useful to differentiate them from each other and from the term blue economy.

The blue economy concept is analyzed then by providing a literature review focused on it. The diverse definitions of the concept are also explored and critically reviewed. Moreover, it has been elaborated, how the Blue Economy concept may fit into the sustainability framework while balancing its economic, social, and environmental pillars. In that context, the links between the Blue Economy, the Sustainable

Development Goals and sustainability are examined. At the same time, the 14th SDG, which concerns life in the water, is highlighted and analyzed further.

The research then analyzes in more depth the blue economy sectors, which are the key drivers, and future trends. The Blue Economy faces challenges in the forms of resource over-exploitation, pollution, habitat degradation and climate change, and prevailing measures to address them, are discussed. Finally, the methods to incorporate low Carbon and innovative technologies, resource efficiency, environmental protection and conservation and social inclusion, in the concept of a blue economy, were suggested.

Keywords: Blue Economy, Sustainability, Sustainable Development Goals, Marine resources, Oceans

ΠΕΡΙΛΗΨΗ

Η παρούσα διατριβή είναι μια μελέτη των δυνατοτήτων της Γαλάζιας Οικονομίας και του τρόπου με τον οποίο θα μπορούσαν να αξιοποιηθούν για την επίτευξη βιώσιμης ανάπτυξης. Η έκθεση παρέχει μια κριτική βιβλιογραφική επισκόπηση, ενώ η μεθοδολογία που ακολουθείται στη διατριβή βασίζεται στην έρευνα Διεθνών Οργανισμών, στις επίσημες αναφορές επιστημόνων και στο δημοσιευμένο νομοθετικό πλαίσιο.

Παραδοσιακά, η ωκεάνια οικονομία αντιμετωπίζεται αποκλειστικά ως μηχανισμός οικονομικής ανάπτυξης. Στο πλαίσιο αυτής της προσέγγισης, η ωκεάνια οικονομία έχει αναπτυχθεί με την εκμετάλλευση των θαλάσσιων και ναυτιλιακών πόρων, συχνά χωρίς να λαμβάνεται υπόψη πώς οι δραστηριότητες αυτές επηρεάζουν τη μελλοντική υγεία ή παραγωγικότητα των ίδιων πόρων. Υπάρχει ανάγκη για βιώσιμη εκμετάλλευση των ωκεάνιων πόρων και προστασία της θαλάσσιας βιοποικιλότητας. Η αυξανόμενη σημασία των ωκεάνιων πόρων οδήγησε στην εμφάνιση του όρου Γαλάζια Οικονομία. Η Γαλάζια Οικονομία είναι μια εξελισσόμενη έννοια που απαιτεί καλύτερη διαχείριση των ωκεάνιων πόρων μας. Περιλαμβάνει μια σειρά από οικονομικούς τομείς και συναφείς πολιτικές που από κοινού καθορίζουν κατά πόσο η χρήση των θαλάσσιων πόρων είναι βιώσιμη. Πολλές πολιτικές έχουν επικυρωθεί για να δούμε πώς η γαλάζια οικονομία θα μπορούσε να αξιοποιηθεί με βιώσιμο τρόπο, δεδομένου ότι οι ωκεανοί που καλύπτουν πάνω από τα δύο τρίτα της επιφάνειας της γης συμβάλλουν σημαντικά στην εξάλειψη της φτώχειας δημιουργώντας βιώσιμα μέσα διαβίωσης.

Η μελέτη ξεκινά με μια σύντομη επεξήγηση των λόγων για τους οποίους οι ωκεανοί είναι σημαντικοί για την ανθρωπότητα και τη ζωή στη γη. Παρουσιάζεται το οικονομικό χαρακτηριστικό των ωκεανών καθώς και οι προκλήσεις που αντιμετωπίζουν. Επιπλέον, αναλύονται τα σχετικά διεθνή νομικά και θεσμικά πλαίσια για τα καθεστάτα διακυβέρνησης των ωκεανών.

Στη συνέχεια, παρουσιάζεται το ιστορικό υπόβαθρο της γαλάζιας οικονομίας. Επίσης, εξετάζεται η εξέλιξη της γαλάζιας οικονομίας συζητώντας άλλες συναφείς έννοιες, όπως η πράσινη οικονομία, η θαλάσσια και ωκεάνια οικονομία και η γαλάζια ανάπτυξη, καθώς είναι χρήσιμο να διαφοροποιηθούν μεταξύ τους και από τον όρο γαλάζια οικονομία.

Στη συνέχεια αναλύεται η έννοια της γαλάζιας οικονομίας παρέχοντας μια βιβλιογραφική ανασκόπηση που επικεντρώνεται σε αυτήν. Διερευνώνται επίσης οι ποικίλοι ορισμοί της έννοιας και εξετάζονται κριτικά. Επιπλέον, αναπτύχθηκε ο τρόπος με τον οποίο η έννοια της γαλάζιας οικονομίας μπορεί να ενταχθεί στο πλαίσιο της αειφορίας, εξισορροπώντας παράλληλα τους οικονομικούς, κοινωνικούς και περιβαλλοντικούς πυλώνες της. Σε αυτό το πλαίσιο, εξετάζονται οι δεσμοί μεταξύ της Γαλάζιας Οικονομίας, των Στόχων Βιώσιμης Ανάπτυξης και της αειφορίας. Παράλληλα, επισημαίνεται και αναλύεται περαιτέρω ο 14ος ΣΒΑΑ, ο οποίος αφορά τη ζωή στο νερό.

Στη συνέχεια, η έρευνα αναλύει σε μεγαλύτερο βάθος τους τομείς της γαλάζιας οικονομίας, οι οποίοι αποτελούν τους βασικούς κινητήριους μοχλούς, καθώς και τις μελλοντικές τάσεις. Η Γαλάζια Οικονομία αντιμετωπίζει προκλήσεις με τη μορφή της υπερεκμετάλλευσης των πόρων, της ρύπανσης, της υποβάθμισης των οικοτόπων και της κλιματικής αλλαγής, και συζητούνται τα επικρατούντα μέτρα για την αντιμετώπισή τους. Τέλος, προτάθηκαν οι μέθοδοι για την ενσωμάτωση των χαμηλών εκπομπών άνθρακα και των καινοτόμων τεχνολογιών, της αποδοτικότητας των πόρων, της προστασίας και διατήρησης του περιβάλλοντος και της κοινωνικής ένταξης, στην έννοια της γαλάζιας οικονομίας.

Λέξεις Κλειδιά : Ωκεανοί, Μπλέ Οικονομία, Βιώσιμη Ανάπτυξη, Στόχοι Βιώσιμης Ανάπτυξης, Θαλάσσιοι Πόροι

INTRODUCTION

Oceans are an important source of a variety of living and non-living resources. They contribute significantly to a country's GDP by facilitating trade and associated activities along with generating employment opportunities throughout the maritime supply chain. At another level, oceans contribute significantly to the production of non-economic goods and ecosystem services that are central to life on earth. Although oceans are seen as an inexhaustible source of resources and an infinite sink, there is a growing awareness of the importance of healthy oceans for life on earth.

A healthy ocean is a key to a sustainable future both for people and the planet. Harnessing the resources of our oceans and coasts can go a long way in meeting this demand, and it is imperative that we do this in a sustainable manner. Humankind has historically pursued and achieved economic progress by exploiting frontiers, moving to the next frontier once the former is exploited.

In the 21st century, coastal countries are beginning to see the ocean as a source of employment, innovation, and competitive advantage. However, the value of the ocean is being decreased by numerous environmental pressures. With the ocean as a driver of economic growth, there are calls from multisectoral organizations, scientists, and the public to ensure that marine industries and the use of marine resources and ecosystems are ecologically sustainable and that economic activities are in balance with the long-term carrying capacity of ocean ecosystems. In response, there is a transition underway worldwide towards the blue economy which is the next economic frontier for maritime nations and views economic development and ocean health as complementary to one another. The blue economy is a concept of sustainable development framework which looks at the oceans as 'Development Spaces' for a country, aimed at supporting sustainable and equitable economic growth through ocean-related sectors and activities.

Despite recognizing the benefits of the blue economy, the concept has yet to be mainstreamed worldwide. While our scientific knowledge of the oceans is well developed, there is a lack of understanding on how best to develop and implement technologies and investment strategies that enhance synergies and reduce trade-offs between sectors in the development of a blue economy.

As such, there is a need for innovative policies, technologies, and financing tools to accelerate the transition towards a blue economy that is low-carbon, efficient, and clean with its growth driven by investments that reduce carbon emissions and pollution, protect and restore ecosystems, enhance the resilience of vulnerable coastal communities, enhance food security and nutrition, and promote sustainable economic growth opportunities.

Purpose Of the Study

This thesis examines the Blue Economy and how it harnesses the potential of the ocean and contributes to the achievement of sustainable development. While there is a clear understanding of the need for sustainable alternatives in human interactions and economic activities with the environment, there is a lack of consensus on the most important and critical factors to achieve the sustainable objective. This research is aimed to fill this gap by bringing together various factors critical for the implementation of Blue Economy policies for Sustainable Development. Further, the study was conducted to further understand the issues, opportunities, challenges, and policy implications for harnessing the potential of the Blue Economy and implementing the sustainable development agenda.

Research Methodology

The research focuses on the systematic analysis of the Blue Economy and the assessment of the most important institutional and legal framework for the management of ocean resources. The report thus, provides a critical bibliographic review, and the methodology followed in the dissertation is based on research of International Organizations, scientists' official references, and the published legislative framework.

Structure Of the Research

Chapter one explains why oceans are important. The economic attribute of the oceans is presented as well as the challenges they face.

Chapter two describes the historical background of the blue economy. Also, examines the evolution of the blue economy by discussing other related concepts such as the green economy, maritime and ocean economy as well as blue growth.

Chapter three analyses the blue economy concept and provides a literature review focused on it. It also examines the diverse definitions of the blue economy, and critically reviews them.

Chapter four contains an elaboration on how the Blue Economy concept may fit into the sustainability framework while balancing its economic, social, and environmental pillars. In that context, the chapter examines the links between the Blue Economy, the Sustainable Development Goals, and sustainability. At the same time, the 14th SDG, which concerns life in the water, is highlighted and analyzed further.

Chapter five analyzes in more depth the blue economy sectors, which are the key drivers of it, as well as future trends.

Chapter six identifies and defines the sustainable blue economy and provides its principles in order to understand what the main characteristics are and achieve a transition to a sustainable blue economy.

Chapter seven analyzes the challenges that hinder the achievement of a sustainable blue economy and identifies the mechanisms for implementing the blue economy to address these challenges.

Finally, the last section of the dissertation presents the main conclusions and actions to guide the development of the blue economy.

1. WHY OCEANS ARE IMPORTANT

For many, the ocean is a place apart, a vast wilderness that extends beyond our physical and psychological horizons, at once alien and indifferent, yet fascinating, and about which we know very little. (Neill, 2015) Without the ocean, the Earth would be similar to Mars, without a life support system. This is because the ocean plays a key role in balancing our climate and weather and is thus necessary for a healthy planet.

The ocean plays a crucial role in the social, economic, and environmental balance of life on earth and is a vital component of our planet, whose protection is essential to ensure the steadiness of our economies, climate, and our health. (SUISSE, 2020) Life originated in the oceans, and they continue to support all life today by generating oxygen, absorbing carbon dioxide, recycling nutrients, and regulating global climate and temperature. (UNEP, 2014)

1.1 The Role of The Ocean

Oceans cover more than two-thirds (approximately 72%) of the earth's surface and contain 97% of the planet's water. (Table 1.1) (UNDESA, 2014) Besides creating livelihoods for billions of people and being a source of natural beauty, the global ocean serves as a huge asset for mitigating climate change, absorbing 93% of climate heat and sequestering 25% of global carbon dioxide (CO₂) emissions, providing us with the water and producing half of the oxygen we breathe. (SUISSE, 2020)

Oceans contribute to poverty eradication, by creating sustainable livelihoods and decent work, providing food and minerals, generating oxygen, absorbing greenhouse gases, mitigating the impacts of climate change, and determining weather patterns and temperatures. (UNCTAD, 2016) (World Bank & UNDESA, 2017)

Moreover, the sea is the main route used for resource transportation, with 90% of world trade moved by it. Marine transportation uses much less energy per kilo of cargo and passenger than other modes such as trains, cars, or planes. (SUISSE, 2020) So, the ocean connects cities and countries around the world, driving economic activity and trade for the 38 percent (and growing) of the global population that lives within 100 kilometers of the sea. In a further, submarine cables cross the ocean's floor to carry 90

percent of the electronic traffic on which communications rely. Also, coastal ecosystems such as coral reefs help protect communities and cities from storm surges and wave damage, while mangroves, seagrasses, and salt marshes are significant natural carbon sinks. (UN, 2016)

The ocean and human health are inextricably linked. The estimated 1 to 1.4 million different species who live in the ocean supply a growing number of medicines and drugs approved to increase human health. (Costello, 2010) (Montaser, 2011) Fish and fish products as well are a rich source of important ingredients such as proteins, lipids, vitamins, minerals, and antioxidants. (SUISSE, 2020) Over three billion people depend on marine and coastal resources for their livelihoods. As a valuable source of nutrition globally, fish provide 4.3 billion people with about 15 percent of their intake of animal protein. (UNDESA, 2014)

The marine and coastal environment also constitute a key resource for the important global tourism industry. In addition, the seabed currently provides 32% of the global supply of hydrocarbons with exploration expanding. Advancing technologies are opening new frontiers of marine resource development from bio-prospecting to the mining of seabed mineral resources. The sea also offers vast potential for renewable “blue energy” production from wind, wave, tidal, thermal, and biomass sources. (UNEP, 2014)

Contains 80% of Earth's life
Carries more than 90% of internationally traded goods
Produces more than half of the oxygen we breathe and provides a livelihood for an estimated three billion people who depend on marine and coastal areas, including for fishing, tourism, trade, transport and energy (UN Conference on Sustainable Development 2012 Fact Sheet).
Moderates the planet's climate by absorbing about 90% of the heat trapped in the ever-thickening atmosphere.
Provides the primary source of protein for more than 3.5 billion people.
Fisheries alone contribute \$100 billion per year to the global economy (Food and Agriculture Organization of the United Nations 2014)
13 of the world's 20 megacities are coastal

Table 1-1 General Characteristics of the Ocean (Spalding, 2016)

1.2 The Economic Value of The Ocean

The ocean can be a new economic frontier, with a growing population seeking new sources of growth and rapid technological developments making new resources accessible. (Economist Intelligence Unit, 2015) (Patil, et al., 2016)

Investing in our ocean is not only an imperative for the health of the planet and humanity, but it also makes good business sense. (SUISSE, 2020) The economic value of global ocean assets is more than \$24 trillion (Figure 1.1), and if the ocean is considered as a country, is expected to be the 7th largest economy in the world with an estimated annual value of goods and services of \$2.5 trillion. (Asian Development Bank, 2021) Between 2009 and 2016, it grew by 9.7%, and by 2030 is expected to grow at twice the rate of the main economy. It is also remarkable that specific sub-sectors such as aquaculture have an even higher underlying growth rate. Between 1990 and 2018, global aquaculture production grew by 527%. (SUISSE, 2020)

In addition, global offshore wind capacity, for example, has grown from almost zero twenty years ago to a capacity of more than 7 gigawatts (GW) today, and projections show a further increase of an order of magnitude by 2050. Maritime trade is also expected to continue to grow at annual rates of at least 3-4% through 2030, and global tourism at a rate of nearly 4% per year through 2025, much of which is likely to be coastal and marine tourism. (OECD, 2016) (Patil, et al., 2016)

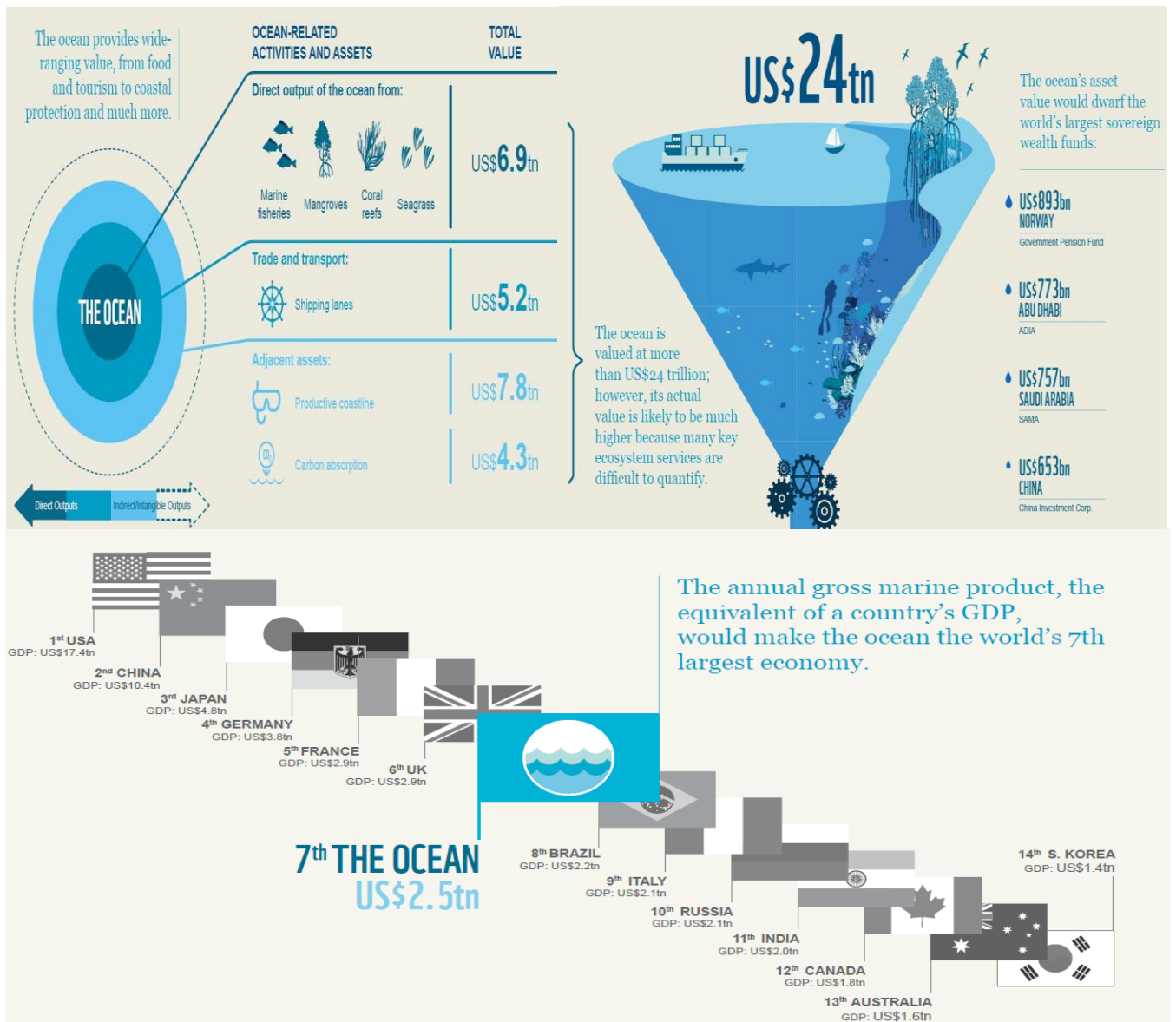


Figure 1-1 Global Ocean Asset Value (O. Hoegh-Guldberg et al., 2015)

It is also important to note that Oceans have become a major driver of global GDP. (Patil, et al., 2016) According to the United Nations, the economic value of the various activities in the oceans is estimated to be between USD 3 and 6 trillion. This comes from services and resources such as:

- the marine transport (90% of global trade flows through the seas),
- the global telecommunications (submarine cables carry 95% of all digital data around the world),

- the source of food (fisheries and aquaculture feeds 4.3 billion people with more than 15% of the annual consumption of animal protein),
- the oil and gas (more than 30% produced from the high seas),
- the marine tourism (5% of world GDP and 6%-7% of world employment),
- the land-based commercial activity (13 of the world's 20 megacities and more than 40%, or 3.1 billion, of the world's population live within 100 km of the ocean or sea in some 150 coastal cities located along the coasts and island states).

The oceans provide at the same time pharmaceuticals and marine vegetation for food while emerging energy sources such as tides, waves, currents and offshore wind are increasingly being harnessed to enhance energy security. (Vijay Sakhuja, 2017)

1.3 The Challenges of The Ocean

As mentioned before Oceans and seas are crucial, as they contribute to all aspects of our life on this planet. Humanity's relationship with the oceans, and how people use and exploit their resources is evolving in important ways as the oceans increasingly become a source of food, energy, and products such as medicines and enzymes. There is also a better understanding of the non-market goods and services that the oceans provide, which are vital for life on Earth. (World Bank & UNDESA, 2017) Although the oceans provide numerous economic, social, and environmental benefits, they face many local and global challenges caused by human activity and climate change. (UNDESA, 2014)

As global warming accelerates, our ocean is reaching a point where it could be transformed from a source of support and healing into a source of damage and destruction. Despite the "breaks" in CO₂ emissions during the global lockdowns caused by the coronavirus, 2020 is poised to be the warmest year on record. Combined with air temperature increases, the last five years have seen the warmest temperatures ever recorded for ocean waters. As the ocean warms, it becomes a key factor in severe weather events. Over the last decade, there have been over 115 climate and weather disasters with losses exceeding USD 1 billion, and the frequency and severity are increasing annually. (SUISSE, 2020)

Climate change is also threatening to erode the very foundations of large coastal areas whilst rising atmospheric CO₂ levels are undermining fundamental aspects of many marine ecosystems through ocean acidification, changing the ocean chemistry at a speed faster than at any time in the last 300 million years. (IGBP, 2013), (UNEP, 2014) Exacerbating the problem, humans continue to produce, consume, and waste at an alarming rate. (SUISSE, 2020) However, oceans, seas, and marine resources are not limitless and are increasingly threatened, degraded, or destroyed by human activities, reducing their ability to provide crucial ecosystem services. (UNDESA, 2015) Plastic waste and wastewater pollution cause over 80% of all coastal and marine degradation, with plastic pollution being the most prominent threat. We can now find plastic on every beach in the world and plastic nanoparticles on most of the fish we consume. People have also over-exploited more than 34% of the world's fish stocks, disrupting the delicate balance of the marine ecosystem. Additionally, agricultural waste run-off causes ocean acidification, destroying coral reefs and making many parts of the ocean uninhabitable for marine life. (SUISSE, 2020)

In particular, the increasing and complex challenges facing the oceans and seas can be divided into five broad categories:

1. Unsustainable exploitation of marine resources, including overfishing, illegal, unreported, and unregulated (IUU) fishing and destructive fishing practices.
2. Marine pollution, which comes from various marine and land-based sources.
3. Invasive alien species, which have moved into areas where they do not occur naturally, and which can negatively affect native ecosystems.
4. The effects of ocean acidification and climate change, caused by increasing concentrations of greenhouse gases in the atmosphere. The negative impacts of climate change include an increase in the frequency and intensity of extreme weather and climate events, rising ocean temperatures, sea-level rise, and changes in ocean circulation and salinity.
5. Physical alteration and destruction of marine habitats caused by unsustainable development of coastal areas, underwater infrastructure, unsustainable tourism, fishing activities in fragile or vulnerable marine areas and natural damage from ship groundings and anchors. (UNDESA, 2014)

Fortunately, the link between oceans, seas and marine resources and human well-being is not one-sided. Although an increase in human well-being is often generated at the

expense of ecosystem integrity, it can also potentially reduce the negative anthropogenic impacts on the marine environment, for example, through more sustainable use of resources, changes in production and consumption patterns, and improved management and control of human activities. However, for this to happen and to face these challenges, good governance, and an enabling environment are needed. (UNDESA, 2015) Adequate and sustainable measures are required through the development of national, regional, and global action plans, strategies, policies, institutional and fiscal reforms and protocols. (UNDESA, 2014)

The importance of oceans for sustainable development is undeniable and is widely recognized by the international community. (World Bank & UNDESA, 2017) It was incorporated, inter alia, in Agenda 21, the Johannesburg Plan of Implementation, and reaffirmed in the outcome document of the Rio+20 Conference. (UNEP, 2014) In the Rio+20 outcome document, “The future we want”, Member States stressed the importance of the preservation and sustainable use of the oceans and seas and of their resources for sustainable development, including through their contributions to poverty eradication, sustained economic growth, food security, and creation of sustainable livelihoods and decent work, while protecting biodiversity and the marine environment and managing the impacts of climate change”. (UNDESA, 2014)

In conclusion, protecting our oceans is not a luxury, but a necessity that contributes to our economy, our climate and our way of life. Only if we all work together can we change the status quo and build a sustainable future. (Spalding, 2016)

Enabling environment

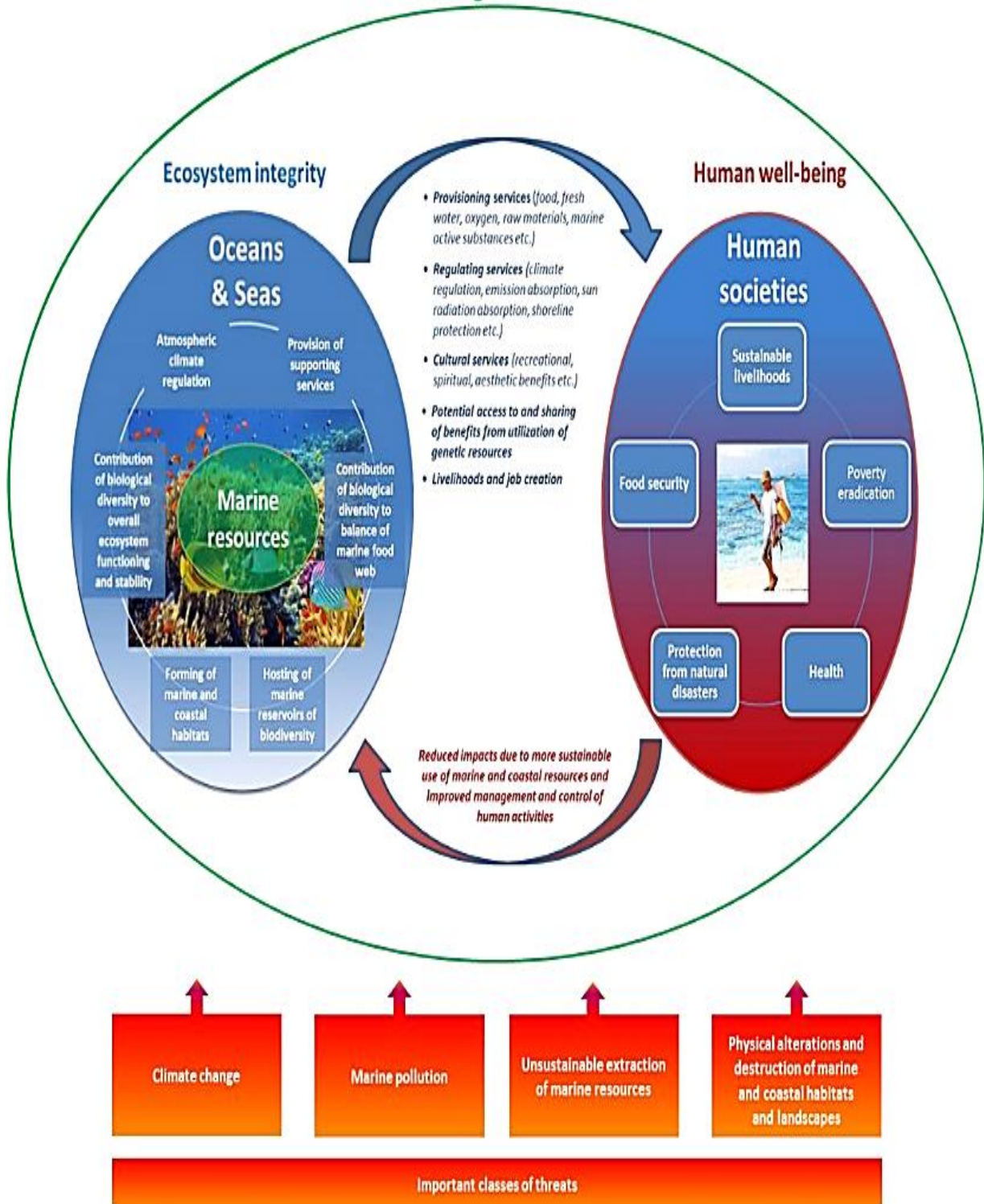


Figure 1-2 Important Classes of Threats (UNDESA, 2015)

2. CONCEIVING THE BLUE ECONOMY

2.1 Blue Economy: Historical Brief

In 1982, the United Nations Convention on the Law of the Sea (UNCLOS), provided the legal framework and set the rules in the marine environment for the management of all marine activities that take place at national, regional, and global levels. (World Bank & UNDESA, 2017) UNCLOS defines the different maritime zones at sea and their legal status, confirms the rights, obligations, and responsibilities of States depending on the zone, promotes peaceful uses of the seas and oceans, and the efficient utilization and conservation of their resources, and protects, and preserve the marine environment. (Ehlers P., 2015)

According to UNCLOS, Maritime zones as presented the Figure 2.1 are:

- (i) Territorial Waters, 12 n.m.
- (ii) Contiguous Zone, 24 n.m.
- (iii) Exclusive Economic Zone, 200 n.m.
- (iv) Continental Shelf, 200mn with an upper limit of 350 n.m., and
- (v) High Seas, beyond the upper limit of Continental Shelf.

Nautical miles (nm) are counted from the baseline of the coastline of each state. The claims of States may not relate to the high seas. (Burnett, et al., 2013)

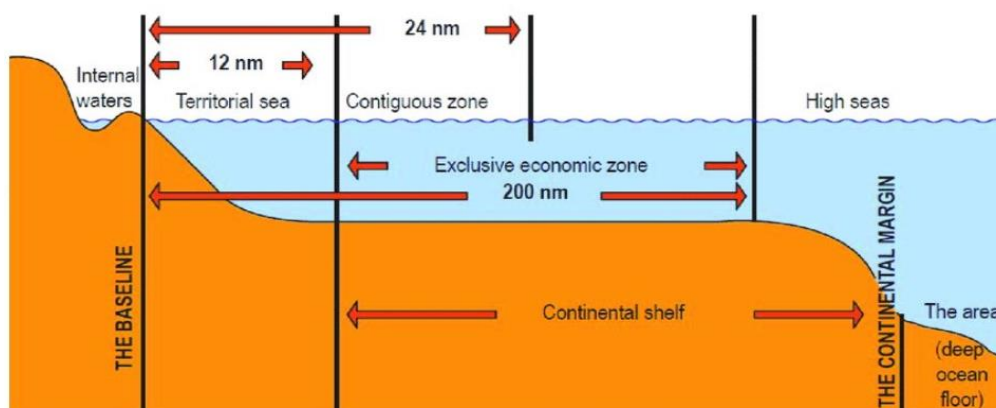


Figure 2-1 Maritime Zones according to UNCLOS. (Norwegian Polar Institute, 2014)

Since the adoption of the UN Convention on the Law of the Sea (UNCLOS) in 1982, countries around the world have been actively engaged in efforts to establish national domination over maritime spaces and the resources contained in them. (Kildow & McIlgorm, 2010) In many cases, these marine jurisdictions are substantial, occasionally larger than a country's land mass, and contain a range of living and non-living resources.

The stagnation of traditional land-based economies and the depletion of land resources has led to greater interest in the economic opportunities contained within and under the sea. (OECD, 2016) Increasingly, coastal states are seeking to secure their maritime borders and to identify and exploit the resources contained therein.

While ocean-related trade and commerce is nothing new, recent trends reflect a shift towards a more planned economy that manages competing uses, allocates 'ownership' and establishes mechanisms and governance systems designed to protect national assets contained within a state's jurisdiction. (Voyer, et al., 2018) In areas beyond national jurisdiction - on the high seas - UN-led negotiations are underway to determine how deep-sea resources should be shared and managed to protect their biodiversity values and create new opportunities for development. (Voyer, et al., 2018) As such, the oceans have become developmental spaces, providing increasing opportunities for coastal states and states with maritime interests to build and develop their economies. (United Nations, 2014)

The Blue Economy approach is based on assessing and integrating the real value of natural capital (in particular ocean resources) into all aspects of economic activity, such as conceptualization, planning, infrastructure development, trade, travel and transport, exploitation of renewable resources, energy production and consumption. The traditional model of development has gradually put enormous pressure on the finite resources of the earth. The evidence of the pitfalls of industrialization and urbanization and their impacts on the environment led to the growing search for alternative models of development. (Md. Shamsuddoha, November 2016)

The historical development of the concept of the "Blue Economy" provides information on the different ways in which the term has been constructed and used by different actors. (Voyer, et al., 2018)

The importance of oceans to mankind was known for centuries, but the relevance of global governance for the development of ocean health came to the fore in the 1990s.

While an entrepreneur and economist Gunter Pauli, introduced in 1994 a new idea of sustainable development involving ocean resources and termed it blue economy (Twomey and Haydn, 2016: 130), this idea did not gain currency until it was adopted in 2012 during the United Nations Conference on Sustainable Development (UNCSD) held at Rio de Janeiro, popularly known as Rio+20 Summit. Rio+20 conference roots lie in the prior 1992 United Nations Conference on Environment and Development (UNCED) also known as the Rio Earth Summit. This summit, building on the earlier Brundtland Report, recognized the importance of development that takes into account the needs of future generations. (Brundtland, 1987)

The Earth Summit in 1992 highlighted the ocean as the target for environmental protection. The Summit emphasized on sustainable use of marine living resources and conserving them in the high seas. Ten years later, the Earth Summit for Sustainable Development in Johannesburg drew a detailed action plan for the implementation of ocean and coastal sector development as proposed in the earlier Rio Earth Summit. As a follow-up, the Millennium Development Goals (MDGs) further expanded the unfinished sustainable development agenda in 2000 and provided a broader space for global political action. (Mohanty, et al., 2015)

Pauli founded Zero Emissions Research and Initiatives (ZERI) and developed a set of ideas aimed at creating links to natural systems - land and ocean. It was later developed in broader detail by the UN preparatory team working on Rio+20 at the request of coastal countries for whom development projects surrounding the most available resources, namely ocean resources, would be most relevant. The background to these efforts of the UN team was documented by a synthesis report entitled Green Economy in a Blue World (UNEP 2012) prepared by a number of international organizations: "Aiming to break the cycle of the brown economy (fossil fuel-based economy)".

The Rio Group focused on promoting the development of a 'Green Economy' and identified the confluence of ideas such as low carbon, resource efficiency and social inclusion that emerged from the concept of the green economy and also added a vital element: the context of those developing countries in the development paradigm whose resources are primarily based on the sea. (UNEP, 2011 p. 16). However, the island states questioned the relevance and applicability of Green Economy to them and argued that 'the world's Oceans and Seas require more in-depth attention and coordinated

action. Thus, in response to the international push to 'green' the global economy, Small Island Developing States (SIDS) began to emphasize the importance of the ocean and marine economy, promoting the concept of the Blue Economy. (Voyer, et al., 2018) (Silver, et al., 2015) (Whisnant & Reyes, 2015)

Although interest in the blue economy has since increased worldwide, (Voyer, et al., 2018) one of the most universally accepted aspects of the blue economy concept is that remains fluid and unclear (Steven, et al., 2019) and is a notion used differently, in different contexts and by different actors. (Choi, 2017) (Eikeset, et al., 2018) (Silver, et al., 2015) (Voyer, et al., 2018) An analysis of how the term was used, in the context of the Rio+20 Earth Summit proceedings, was conducted by Silver, et al. (2015), and highlights the way in which the Blue Economy was a concept used by various groups within the negotiation process to pursue specific ideas and actions. Four dominant discourses were identified.

(1) Oceans as natural capital: used mainly by environmental NGOs, who used the term as a means to argue that the ecosystem services provided by marine environments should be better recognized and valued.

(2) Oceans as good business: this theme, promoted by maritime sectors such as fisheries and shipping, as well as development agencies, called for greater recognition of ocean-based industries and their contribution to society.

(3) Oceans as an integral part of Pacific Small Island States (SIDS): The Pacific SIDS were actively involved in framing the Blue Economy around their livelihoods and development goals.

(4) Oceans as a source of livelihoods for Small-Scale Fisheries (SSF): this theme focused on poverty reduction and the role of SSF in providing a source of protein and livelihoods for the world's poor. It was largely promoted by organizations and advocates of SSFs, including development organizations and SIDS. (Silver, et al., 2015) (Voyer, et al., 2018)

ECOSYSTEMS SERVICES

From natural capital to benefits to society

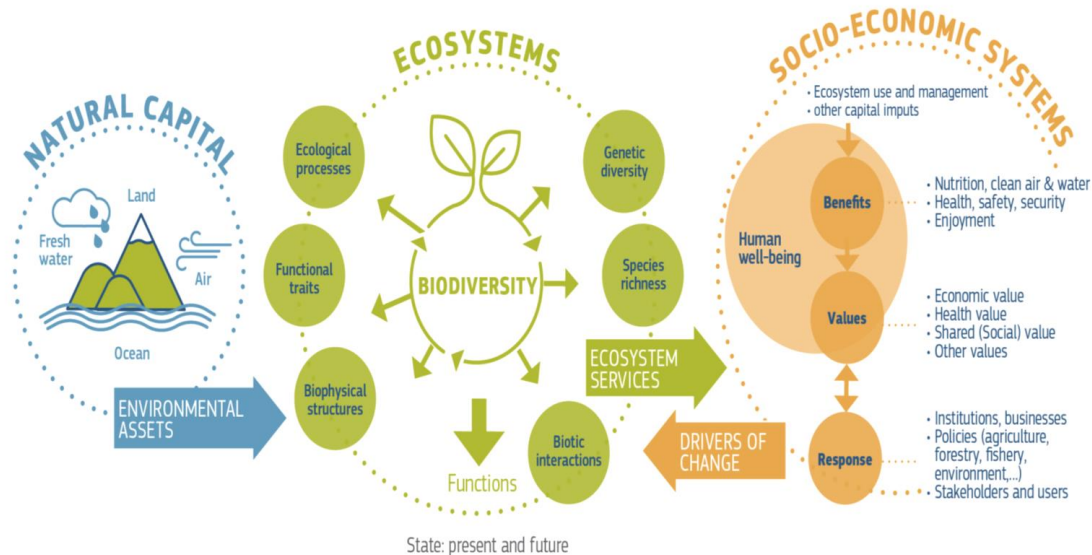


Figure 2-2 Natural capital, ecosystem services and its use in socio-economic systems. (EC, 2020)

Also, The United Nations expanded the mandate of the 1982 United Nations Convention on the Law of the Sea (UNCLOS) and began to address maritime spaces beyond national jurisdiction and called for the convening of an intergovernmental conference to draft a legally binding treaty for the conservation of marine life and the governance of the mostly lawless high seas beyond national jurisdiction. (Vijay Sakhuja, 2017)

Finally, the key conclusions from the 2010 UN General Assembly High-Level Plenary Meeting and the Rio+20 conference led global thinking in developing a composite global action plan for development as the Global Sustainable Development Agenda during the High-Level Summit in September 2015. (Mohanty, et al., 2015)

2.2 Blue Economy, It's Roots on Green Economy

While the blue economy is a specific theme of the environmental economy, it emerged either as an extension of the green economy or as part of it. (Beaudoin, 2012)

The origin of the green economy comes before the blue economy. To be more specific, the concept of the green economy emerged in 1989 in a report for the UK government prepared by a group of leading environmental economists entitled, "Blueprint for a Green Economy". (Pearce, et al., 1989)

Although there is no standard definition, the green economy can be defined as an economy "that results in improved human well-being and social equity while significantly reducing environmental risks and ecological scarcity". (UNEP, 2013)

The green economy is considered by some researchers as a subset of the environmental economy but has a more politically applied focus towards ecological and economic challenges. (Bina, 2013)

The definition above fits the blue economy concept, except that the blue economy only considers blue resources and ecosystems. Thus, the blue economy can be understood as part of the green economy (Allen & Stuart Clouth, 2012) as well as an extension of it, as it can be understood as a different science that adopts similar methods of approaching the goals of the economy and society. (Manikarachchim, 2014)

As stated in the United Nations Environment Programme (UNEP) report "Green Economy in a Blue World" published in 2012 (Beaudoin, 2012), an explicit will to expand the blue aspect of the green economy has been shown. "During the preparatory process for Rio+20, many coastal countries have questioned the focus of the Green Economy and its applicability to them. To these coastal countries, the Blue Economy offers an approach to sustainable development that best suits their circumstances, their limitations and their challenges". (United Nations, 2014) Thus, the Blue Economy can be interpreted as the new system of green economy that promotes both sustainable use and preservation of the ocean ensuring the continued survival of planet earth, although it focuses mainly on marine resources. (Kathijotes & Sekhniashvili, 2017)

2.3 Ocean and maritime economy

To explore the misinterpretation of the blue economy concept, it is important to compare terms that can sometimes be confused with it. Concepts such as the marine economy or the ocean economy, although similar, have their own fields of study and action.

According to the EU Blue Economy Report, the maritime economy includes all activities related to the sea. However, this is a general definition that could be applied to the blue, ocean and maritime economy and needs to be deepened. (EC, 2019) Consequently, the UK development and planning agencies and the Chambers of Commerce and Industry have built a definition of the marine economy. Thus, the marine economy consists of all sectoral and cross sectoral economic activities which are related to the oceans, seas and coasts. It is not limited only to marine activities, as it combines not only direct but also indirect supporting activities that promote the functioning of the marine economy sectors, integrating activities that take place on land. (Ecorys, et al., 2012)

On the other hand, according to the OECD report (OECD, 2016), the ocean economy can be defined as the sum of the economic activities of ocean-based industries, and the assets, goods, and services of marine ecosystems.

The blue economy takes a more in-depth look at sustainability than the ocean and maritime economies, which are based on the concentration of individual businesses and sectors. It is an attitude that takes into account the harmful effects that human activity has left on the ocean ecosystem, representing risks for all of humanity, especially for the part that depends on marine activity. In addition, the blue economy addresses social issues to achieve higher levels of sustainable development, where education and innovation play a key role. (EC, 2019)

It is therefore clear from the literature review above that the ocean economy or the marine economy are not synonymous with the blue economy. The blue economy, like the green economy, seeks political coherence, at regional, national and international level, and more investments, promoting direct and indirect sustainable development. (EC, 2019) (Keen, et al., 2018) (Voyer, et al., 2018) This humanitarian, environmental and political awareness added to the purely economic vision of blue resource

management (which characterizes ocean and marine economies) explains the need to develop this new concept.

2.4 Derived concepts of the blue economy- The Blue Growth

European Commission did the first approach to blue growth in 2012. Blue growth is a strategy for sustainable economic growth and job creation aimed at reducing poverty while addressing resource scarcity and climate extremes. (Brears, 2021) It can be framed by the European Union's international competitiveness, resource efficiency, and job creation while protecting biodiversity and safeguarding the services provided by healthy and resilient marine and coastal ecosystems. (Mulazzani & Malorgio, 2017) Blue growth aims to promote the development of maritime economic functions in a sustainable manner.

In 2007 The European Commission set up the Integrated Maritime Policy (IMP), which promoted the development of the marine industry at sea basin level. (Dalton, et al., 2018) It is an integrated approach with a framework that applies to the entire marine economy. It aims to develop coordinated, coherent, and transparent decision-making policies, and to maximize the sustainable development, economic growth, and social cohesion of EU's Member States. (EPRS, 2020) IMP has been recognized as the first step in realizing Europe's future policies and Strategies. (Ecorys, et al., 2012)

As part of this broader scope, in 2012 the Commission launched its Blue Growth Strategy, which is the current long-term policy framework for enhancing all economic activities that are related to the oceans and seas and for stimulating the growth of the blue economy. Instead of introducing new legislation, it focuses on a series of "enabling" actions such as data collection, research and innovation, maritime surveillance, funding programs, and actions to improve the skills of the workforce.

The strategy highlights the fact that the blue economy must be sustainable and respect potential environmental concerns, given the fragile nature of the marine environment. It focuses in particular on five sectors selected following a study that analyzed the potential for innovation and job creation in the blue economy and where additional efforts at the EU level could stimulate long-term growth and employment in the blue economy: blue energy, aquaculture, coastal and marine tourism, blue biotechnology and marine mineral resources. (EPRS, 2020)

Concluding blue growth reflects the economic dimension through the long-term vision, providing practical weapons for the development of the blue economy strategy. Blue growth is the blue economy's goal, once sustainable growth (implicit in blue growth) is a fundamental aspect of the blue economy. (Ecorys, et al., 2012)

Concept	Sectors	Goals	Institutions
Green economy	Ecological and social resources	Green growth: To improve human well-being and social equity, while significantly reducing environmental risks and ecological scarcities.	United Nations, OECD, EC, WWF
Blue economy	Ocean resources, maritime natural capital and social capital	Blue growth: To improve economic processes and social infrastructures towards a sustainable use of ocean resources. It seeks to promote social inclusion and national equity.	United Nations, EC, WWF, World Bank, Commonwealth of Nations
Maritime economy	All economic activities linked to the sea	Efficient management of economic activities whose development depends on the sea, direct or indirectly.	EC
Ocean economy	Ocean-based economic activities and the assets/services of marine ecosystems	Efficient management of the economic activities of ocean-based industries, and the assets, goods and services of marine ecosystems	United Nations, OECD, EC, WWF, World Bank

Table 2-1 Summary of concepts related to the blue economy

3. THE BLUE ECONOMY

3.1 Understanding of Blue Economy

The increased focus on the oceans as a development space has occurred in the context of increased recognition of the profound changes underway in the world's oceans in response to climate change, overfishing, habitat destruction, and pollution. Oceans are therefore often framed in two competing ways: as areas of opportunity, growth and development, and as threatened and vulnerable spaces in need of protection. We may consider the Blue Economy as an emerging term arising from some of the inherent conflicts between these two discourses - the development and the protection of ocean resources. (Lee, et al., 2020) As a concept, it seeks to embrace the opportunities associated with the ocean, while recognizing, accounting for and, in some cases, addressing its threats. (Voyer, et al., 2018) In this respect, it follows its precursor of the 'Green Economy' in its attempts to use capitalist markets to address environmental threats. (Voyer, et al., 2018) It also forms part of the broader sustainable development movement which commenced with the Brundtland Report, and originally focused heavily on terrestrial improvements in environmental management. (Eikeset, et al., 2018) (Brundtland, 1987)

Thus, human use of the ocean, particularly in the context of the economic benefits we derive from it, has recently been reframed as the 'Blue Economy'. (Steven, et al., 2019)

Although the use of the term "Blue Economy" has grown exponentially over the last decade (Mulazzani & Malorgio, 2017), there remain many unanswered questions about the conceptual and practical applications of the emerging and increasingly influential concept of the Blue Economy. (Voyer, et al., 2018) So, while the concept of the Blue Economy is increasingly invoked as an ideal, it is not well conceptualized with an explicit mapping of its key components and, therefore, its usefulness to date has been more conceptual or political than practical. (Keen, et al., 2018)

As a conceptual framework blue economy's utility is heuristic—is a means to stimulate discussion that can enable researchers and practitioners to better understand, assess, and contextually modify, the Blue Economy concept and its implementation for the sustainable development of oceans. (Keen, et al., 2018)

The Blue Economy is increasingly playing a central role in negotiations over the future use of the world's oceans, including the progress towards the UN Sustainable Development Goals (SDGs), yet it is unclear as to whether the negotiations are occurring in a common language, or with an adequate understanding of the implications of the competing ways the term is employed and enacted. (Voyer, et al., 2018)

The blue economy helps all of the Sustainable Development Goals (SDGs) of the United Nations, particularly SDG14, "Life Below Water." It recognizes that this will need bold, coordinated efforts now, just for sake of current and future generations, to ensure sustainable, protect, and conserve our ocean. (Pauli, 2010) (Mesut, 2021)

It's clear that there are differences both in terminology – for example, the terms Blue Growth, and Sustainable Ocean Economy are often used to refer to the same or similar concepts- and in the definitions used by states and organizations, which reflect whether they view the Blue Economy primarily as good business, natural capital, to sustain livelihoods or to promote innovation. (M. Voyer, et al., 2018) (Steven, et al., 2019)

A very general understanding of the blue economy can be given by the World Bank as "encompassing the range of economic sectors and related policies that together determine whether the use of ocean resources is sustainable". (World Bank & UNDESA, 2017) Indeed, the sustainability and preservation of marine resources is a concern of the blue economy. Moreover, this sector is interested in the social and economic development of societies in the long term through a pragmatic and political approach, differentiating it from the perspective of marine and ocean economies. (Kathijotes & Sekhniashvili, 2017)

Today, the exploitation of ocean resources includes a range of traditional economic activities such as fishing, aquaculture, tourism, but also emerging sectors such as energy production, biodiversity research and marine biotechnology. The management not only of marine resources, but also of coastal resources, brings a new added interest because of their intense exploitation and abuse in recent decades, of increasing industrialization, consumerism, and pollution. This leads to the need to create protection, conservation, and regulation activities at a much higher level than ever before, for which the blue economy provides practical responses. (Fedrigo-Fazio & Brink, 2012)

Furthermore, international integration at the policy and regulatory level with a focus on marine resources is fundamental, considering that "ocean activities vary in each

country, depending on unique national circumstances and the national vision adopted to reflect its own conception of the blue economy". (World Bank & UNDESA, 2017) More than individual regulations, a deeper collaboration between nation-states and between the public and private sectors is needed, strengthening government responses towards blue economy goals. (World Bank & UNDESA, 2017)

3.2. The Blue Economy Concept

The Blue economy is a relatively new concept, and its understanding has grown and gained emphasis in this century, and especially in the last decade, with the also growing movement of environmental protection towards climate emergency. (Kathijotes & Sekhniashvili, 2017)

In the Rio+20 Conference the Blue Economy, which derived from the concept of the Green Economy, was adopted, having the desired outcome of improving human well-being and social equity, while significantly reducing environmental risks and ecological deficits, supporting low carbon, resource efficiency, and social inclusion. This desired outcome is also found in the United Nations Environment Program's Green to Blue Economy (Steffen, 2012) and is based on the current conditions and needs of a developing, changing, and increasingly more populous planet, whose future resource base lies in the oceans.

At the heart of the concept is the separation of socioeconomic development from environmental degradation, traditionally considered the global status quo. (Smith-Godfrey, 2016)

In contrast to the contractual development model, where economic and natural capital are seen to take priority over human and natural capital, the blue economy deliberately seeks to invest more in the social and environmental outcomes (UN Economic and Social Commission for Asia and the Pacific [ESCAP] 2012). Its approach intends to upgrade traditional uses of the ocean, using the most modern technologies, driven by new favorable public policies and sustainable development. (Roberts & Ali, 2016)

In addition, the maintenance of ocean ecosystems and biological resources can bring multiple economic, environmental, and social benefits to individual sectors and society, providing wider ecosystem services and increasing human well-being. Thus, the notion of a blue economy is to promote economic development, social inclusion, and the

preservation or improvement of livelihoods while ensuring the sustainability of oceans and coastal areas. (Bennett, et al., 2019) (Brears, 2021)

This concept is increasingly linked to commercial and trade activities and stems from the need to integrate conservation and sustainability into marine sector management. It can also be extended to include ecosystem or marine ecology. The sustainable development element allows for the integration of consumption-based activities and replacement patterns, while generating low or zero greenhouse gas (GHG) pollutants, which is essential in the process of carrying out activities. This element of sustainability is also considered to indicate the long-term sustainability of the seas, which provide food for both animals and humans.(Smith-Godfrey, 2016) (Bennett & Dearden, 2014)

Blue economy can occur when economic activity is in balance with the long-term capacity of ocean ecosystems to support activity in a sustainable manner. (Lee, et al., 2020) Although the term 'blue economy' has been used in various ways, it is understood to encompass the range of economic sectors and related policies that together determine whether the use of ocean resources is sustainable. A major challenge of the blue economy is therefore to understand and better manage the many aspects of ocean sustainability, ranging from sustainable fisheries to ecosystem health and pollution. Another important issue is the realization that sustainable management of ocean resources requires cooperation between nation-states and between the public and private sectors, and on a scale that has not been achieved in the past. (World Bank & UNDESA, 2017)

Under "business as usual", the costs of degradation of marine ecosystems from human uses should be high but have not been quantified or considered. Simultaneously, the economic contribution of the oceans to humanity has been significantly underestimated (Economist Intelligence Unit, 2015), particularly in terms of the value of non-market goods and services such as carbon sequestration, coastal protection and recreation, as well as cultural values. What is needed is a new form of understanding the oceans, which integrates environmental and social dimensions, requires a paradigm shift, recognizing and valuing all the benefits of the oceans. (UNEP, 2015) The blue economy goes beyond business as usual and takes into consideration economic development and ocean health as compatible propositions. It comes from the realization that humanity cannot continue, let alone accelerate, anthropogenic changes in ocean ecosystems. Environmental risks and ecological damage from economic activity are mitigated or

significantly reduced in a blue economy. (Economist Intelligence Unit, 2015) This balances economic activity with the long-term capacity of ocean ecosystems to support that activity and remain resilient and healthy. It is therefore considered a long-term strategy that aims to support sustainable and equitable economic development through ocean-related sectors and activities while improving human well-being and social equity and protecting the environment. (UNEP, 2013); (UNCTAD, 2016)

The blue economy, both as a concept and in practice, is relevant to all countries and can be implemented at different scales, from local to global. (World Bank & UNDESA, 2017) Several states, particularly maritime states, have adopted the concept of Blue Economy. Given the multiple strengths of the Blue Economy, its development resonates among international and regional organizations such as the United Nations, the African Union (AU), the European Union (EU), the Indian Ocean Regional Association (IORA), the Asia-Pacific Economic Cooperation (APEC), and the South Asian Association for Regional Cooperation (SAARC), which have adopted ocean-based development as an important agenda for cooperation, growth and prosperity. Certainly, the Blue Economy is as important for coastal and island states as it is for land-based states. Small Island Developing States (SIDS) such as Mauritius, Seychelles, Maldives, and bigger countries such as Bangladesh and India have advocated the Blue Economy in various forums and are actively involved in promoting its development. (Vijay Sakhuja, 2017)

3.3 Literature Review on The Blue Economy Concept

As mentioned before since the 21st century, the "Blue Economy" concept has become increasingly popular. The international community believes that the blue economy covers three economic forms: The economy addressing the global water crisis (McGlade, et al., 2012), the innovative growth economy (Pauli, 2009), and the development of the marine economy. (Behnam, 2012)

The research literature on the blue economy basically includes the following aspects. Kathijotes (Kathijotes, 2013) has articulated that the aim of blue economy models is to shift resources from scarcity to abundance and begin to address issues that cause environmental problems. Mulazzani et al. (Mulazzani, et al., 2016) proposed the management tool based on the ecosystem services framework to solve coastal blue

growth. Soma et al. (Soma, et al., 2018) proposed to achieve long-term sustainable blue development through cooperation, integration, and trust in the marine sector. Van den Burg et al. (Van den Burg, et al., 2019) focused on summarizing the potential limits of marine sector development from the spatial dimension of blue growth.

Most of the management studies on the blue economy are based on the perspective of sustainable development. Keen et al. (Keen, et al., 2018), designed a conceptual framework for the blue economy that can be used to evaluate sustainable marine management. Furthermore, Sarker et al. (Sarker, et al., 2018) developed a framework for blue growth management emphasizing that joint efforts are needed to promote blue growth and achieve sustainable development goals (SDGs). Howard (Howard, 2018) had an in-depth discussion on the role of stakeholders in sustainable development. (Wenhai, et al., 2019)

As Andrew D. L. Steven, et al. (Steven, et al., 2019) stated, we may assume that the Blue Economy has emerged as an alternative model of development to ensure inclusive growth and prosperity in the world.

Growth presents many challenges, the most important of which is managing the many, potentially competing, uses of the ocean, while lifting people out of poverty and protecting the environment that supports this wealth. Economic growth is accompanied by a set of environmental and social challenges that must be resolved, so science, technology, and innovation will be essential to the development of a socially just and sustainable Blue Economy. If done well, we can address many of the issues that threaten our coasts and oceans. (Halpern, et al., 2012)

3.4 Blue Economy Definitions Overview

Undoubtedly, the interest in the Blue Economy has increased around the world, receiving attention from the public and policymakers. However, there is still no accepted definition of the Blue Economy. (Choi, 2017); (Silver, et al., 2015); (Voyer, et al., 2018) The interpretation of the term differs from one organization to another. Some definitions from international organizations are explored and are presented below.

❖ United Nations

In a concept paper published in 2014, the United Nations offered a general definition of the “Blue Economy” as an ocean economy that aims "to improve human well-being and social equity while significantly reducing environmental risks and ecological deficits." (UNEP, 2014) (Lee, et al., 2020)

A United Nations representative recently defined the Blue Economy "as the set of economic sectors and related policies that together determine whether the use of ocean resources is sustainable. According to this definition, a major challenge of the blue economy is therefore to understand and better manage the many aspects of ocean sustainability, ranging from sustainable fisheries to ecosystem health and pollution." (Brears, 2021)

❖ Word Bank

More recently, the World Bank, (World Bank & UNDESA, 2017) while acknowledging the different aspects of the Blue Economy, comes up with the following definition. The Blue Economy " is the sustainable use of ocean resources for economic growth, improved livelihoods and jobs while maintaining the health of the ocean ecosystem.” The World Bank’s definition is a comprehensive concept that also encompasses many aspects of ocean sustainability, from sustainable fisheries to ecosystem health and pollution prevention. Importantly, the definition itself calls for cooperation at the cross-border and sectoral levels through various partnerships and stakeholders. However, different stakeholders will prefer specific focuses or interpretations of the definition to meet their own purposes. This implies that some potential conflicts or problems may arise due to the preferences or interests of different stakeholders. (Voyer, et al., 2018) (Lee, et al., 2020)

Similarly, the World Bank's concept paper on complexity in small island developing states (SIDS) (Everest-Phillips, 2014) provides a working definition of a blue economy as follows: "A blue economy is a sea-based economic development that leads to improved human well-being and social equity while reducing environmental risks and ecological deficits." (Smith-Godfrey, 2016)

❖ The World Wildlife Fund (WWF)

The World Wildlife Fund in its report (WWF, 2018) “Principles for a Sustainable blue economy” starts with two senses given to this term: "For some, the blue economy means using the sea and its resources for sustainable economic development. For others, it simply refers to any economic activity in the maritime sector, whether sustainable or not."

❖ European Commission

The European Commission defines the blue economy as "all the economic activities that are related to oceans, seas and coasts, covering a wide range of interconnected established and emerging sectors". (EC, 2018)

❖ The Commonwealth

In the Commonwealth report, (Roberts & Ali, 2016) presented a general interpretation of the blue economy, according to which it can maximize the economic value of the marine environment in a sustainable way that conserves and protects marine environmental resources and marine ecosystems. According to this definition, the blue economy can be broadly defined as "an economic activity that uses the sea directly or indirectly as an input". (Morrissey, et al., 2010)

Other definitions of the Blue Economy have been established by the Australian Government, the Indian Ocean Rim Association, and The Economist magazine. (Voyer, et al., 2018) (Economist Intelligence Unit, 2015) (Mohanty, et al., 2015)

❖ Australian Government

Australia considers that the substance of the blue economy is to promote the development of marine industries that benefit ecologically, economically, and socially from the marine ecosystem and ensures that the ecosystem-based management model should be at the heart of the decision-making process for industrial and community development. (Australian Government, 2012)

❖ Indian Ocean Rim Association (IORA)

Mohanty, Dash, Gupta and Gaur (Mohanty, et al., 2015) define the blue economy more systematically, making a clear distinction between seemingly similar concepts such as the ocean economy, the coastal economy and the marine economy. For them, the 'blue economy' covers all ocean-related activities, including the direct and indirect supporting activities required to operate these economic sectors, while adjusting for the costs of environmental damage and ecological imbalances caused by the exploitation

of ocean resources for consumption. The blue economy differs from the green economy as it goes beyond conservation and addresses sustainability issues by focusing on regeneration and the evolutionary trajectory of ecosystems.¹ In terms of sustainability, the blue economy links production and consumption systems to the long-term capacity of ocean ecosystems and predicts the efficiency and optimization of marine resources up to ecological limits. (EIU, 2015; UNCTAD, 2014) In terms of general principles, the key elements that represent the distinctive characteristics of the blue economy are local sourcing of raw materials, employment of local labor, use of low-carbon energy sources, recycling of waste, diversification of food and living choices, conservation of living and non-living marine resources, promotion of small-scale industries and etc. ² (Mohanty, et al., 2015)

❖ The Economist

The Economist in its report on “The Blue Economy: "Growth, Opportunity and a Sustainable Ocean Economy”, prepared by its Intelligence Unit 5 in 2015, points out the wide and loose interpretation of the term that makes it a fluid concept, open to differing interpretations. (Md. Shamsuddoha, November 2016)

Terming the turn to the blue economy as a new wave of industrialization of oceans, The Economist reaches to a working definition of Blue Economy as follows:

“A sustainable ocean economy arises when economic activity is in balance with the long-term capacity of ocean ecosystems to support that activity and remain resilient and healthy”. (Smith-Godfrey, 2016)

It is particularly noteworthy that most definitions include a focus on the ‘triple objectives’ of environmental sustainability, economic growth, and social equity, driven by an integrated approach to ocean governance and technological innovation. (Smith-Godfrey, 2016) (Voyer, et al., 2018)

3.4.1. Criterial Definition of Blue Economy

Smith-Godfrey (at a journal report) presented the result of a qualitative comparative analysis (QCA), (Ragin, 2008) according to which the definition of the blue economy could be as follows: "The Blue Economy is the sustainable industrialization of the oceans for the benefit of all".

- The motivation for the word "sustainable" is the inclusion of the Blue Economy concept which comes from the Green Economy: the balance between activities (economic, commercial, legislative, and regulatory), the supporting system (ecological environment), and the communities that depend on it (livelihoods and food). This balance can be calculated and has the potential to be translated into a measure of effectiveness in achieving the balance.
- The rationale for including the term "industrialization" derives from the meaning of the word, which denotes large-scale manufacturing, advanced technical enterprises as well as other productive economic activities in a region, society, or country. Industrialization can also be described as the conversion of the methods, objectives, and ideology of an economic activity for achieving development in a region. Industrialization is quantifiable and can be expressed as a measure of effectiveness.
- The term "oceans" is included to identify the operating environment and to differentiate it from the land where traditional activities take place.
- The driver for the inclusion of "benefit" is to balance the improvement of equity and well-being of both humanity and the environment with the reduction of ecological deficits by introducing the elements of resource efficiency and a low-carbon footprint.
- Finally, the motivation of the word "all" is to emphasize that it is a holistic, comprehensive approach that covers people, systems and operations and is gifted with a calculation function, making it a measure of effectiveness. (Smith-Godfrey, 2016)

3.5 What Is the Blue Economy

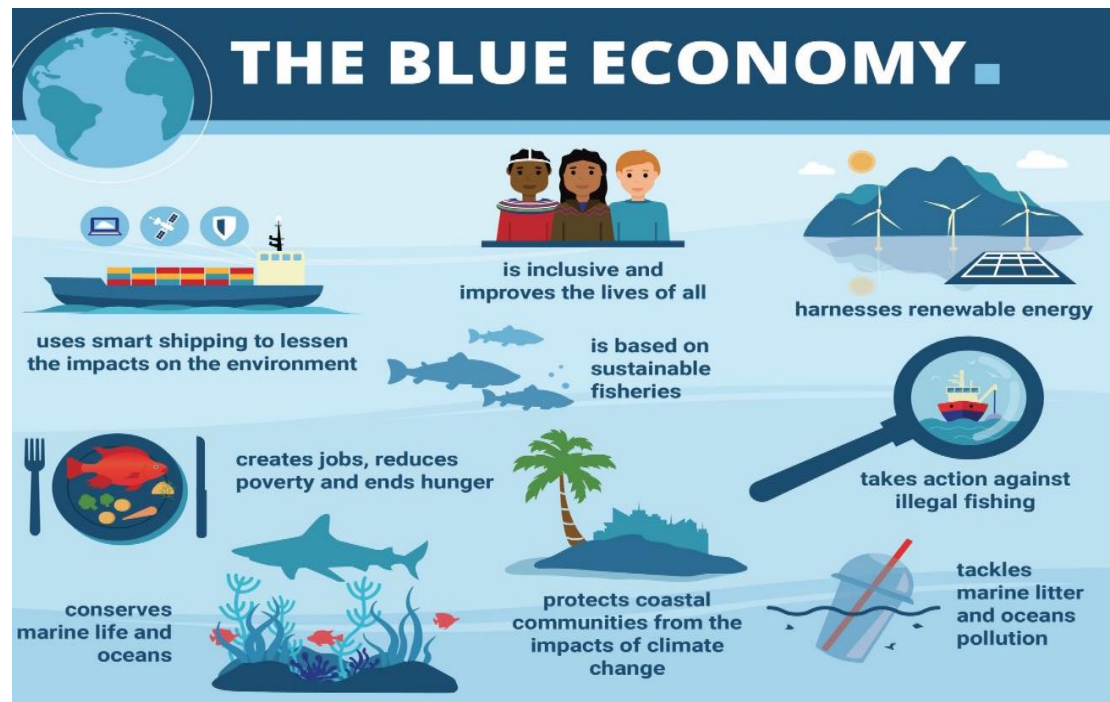


Figure 3-1 Blue Economy Characteristics. Source: <https://www.oceanactionhub.org/what-blue-economy>

3.5.1 Blue Economy Characteristics

Although there is no universally accepted definition of a blue economy, we can describe what a blue economy might look like by providing some characteristics. An overview of green economy approaches highlights seven highly inter-related characteristics that should be predominant in an effective blue economy framework.

1. Recognizes the essential value of natural capital as the basis for a healthy marine environment that supports the continued provision of marine goods and services
2. Sustains growth, enhances blue businesses, and promotes jobs in blue sectors
3. Promotes energy from low carbon co2 and renewable sources
4. Addresses resource scarcity and promotes increased resource efficiency through improved and enhanced natural resource management
5. Ensures resilience to the foreseeable impacts of climate change through the development of adaptive capacities
6. Supports the building of the technical capacity needed to achieve the government's stated objectives; and

7. Promotes sustainable management of our ecosystem and finite resources (Roberts & Ali, 2016)

3.5.2 The Blue Economy Sectors

The blue economy encompasses both the economic uses of the ocean and ocean resources and the natural assets and ecosystem services that the ocean provides. It is important to notice that the blue economy is more than just a way of looking at the ocean as a source of revenue and commercial possibilities. Instead, it could be seen as a new governance tool used to articulate the appropriate use of the oceans at the global, regional, and national scales. (Voyer, et al., 2018) Massive, industrialized nations have seen the development of their ocean economies through the exploitation of marine and maritime assets under a business-as-usual approach. For example, shipping, fish farming and the oil, gas, minerals, and mining sectors, operate without regard to the long-term health or efficiency of these same resources. (Mesut, 2021) Also, the blue economy helps vulnerable governments manage, the often, devastating impacts of climate change by protecting and developing intangible blue resources such as lifestyle and carbon sequestration. (Mi J, 2015)

Therefore, Blue economy includes activities that explore, develop, and use ocean resources, use ocean space, and protect ocean ecosystems. (Rayner, et al., 2019) It involves all economic activities with direct dependence on the ocean or coastal and marine resources.

More specifically it contains economic activities that are (a) ocean-based and (b) ocean-related. Ocean-based activities are those that take place in the ocean such as fishing and aquaculture, offshore oil and gas, mining, ocean energy, desalination, shipping/maritime transport, marine tourism, and marine construction. The Ocean-related activities use products from the ocean e.g., seafood processing, marine biotechnology, chemicals, salt, etc., and produce products and services for the ocean and ocean-based activities i.e., shipbuilding and ship repair, ports, resorts, communication, maritime insurance and law, maritime technical services, etc. (UNDP, 2018) Their effective operation depends on depth, as shown in Figure 3.2, which illustrates the activities that can operate effectively at each depth. (Van den Burg, et al., 2019)

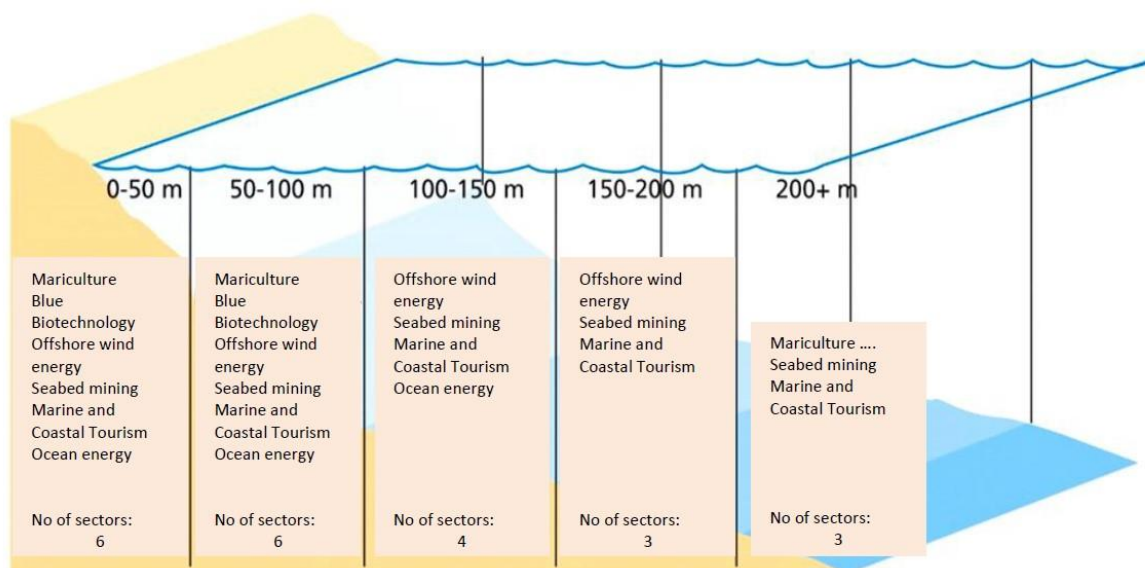


Figure 3-2 Blue Growth sectors operate depending on depth. (Van den Burg, et al., 2019)

Moreover, it includes maritime education and research, as well as the activities of public sector organizations with direct responsibilities on the coasts and oceans, such as national defense, coastguard, and marine environmental protection.

Despite all this, the ocean produces also economic values that are not usually quantified, such as habitat for fish and marine life, carbon sequestration, shoreline protection, recycling and waste storage, and ocean processes that affect climate and biodiversity.

New activities such as desalination, marine biotechnologies, ocean energy and seabed mining have also developed in recent years. Innovations in activities aimed at protecting the health of the oceans are also taking place, such as ballast water and invasive species management, waste-to-energy, low footprint wastewater treatment systems, etc. Ecotourism, eco-ports, and eco-ships aim to make these industries more environmentally sound, while ocean energy offers low carbon and renewable energy. These innovations and emerging markets offer opportunities for investment and business, further contributing to the development of the blue economy. (Ebarvina, 2016)

The mix of oceanic activities varies in each country, depending on their unique national circumstances and the national vision adopted to reflect its own conception of a blue economy. (UNDP, 2018) The World Bank highlights that in order to qualify as components of the blue economy, activities need to (as illustrated by Table 1.1):

- Provide social and economic benefits for current and future generations.
- Restore, protect, and maintain the diversity, productivity, resilience, core functions, and intrinsic value of marine ecosystems.
- Promoting clean technologies, renewable energy sources and the principles of the circular economy, i.e., decoupling economic growth from resource consumption, waste reduction and recycling of materials (World Bank & UNDESA, 2017)

In concluding, the blue economy has diverse components, including both established traditional ocean industries such as fisheries, tourism, and maritime transport, and new and emerging activities, such as offshore renewable energy, aquaculture, seabed extractive activities, and marine biotechnology and bioprospecting. (World Bank & UNDESA, 2017) In addition, a number of services provided by ocean ecosystems, and for which markets do not exist, contribute significantly to economic and other human activity such as carbon sequestration, coastal protection, waste disposal and the existence of biodiversity. (UNDP, 2018)

Type of Activity	Ocean Service	Industry	Drivers of Growth
Harvesting of living resources	Sea food	Fisheries	Food security
		Aquaculture	Demand for protein
Extraction of non-living resources, generation of new resources	Marine biotechnology	Pharmaceuticals, chemicals	Research and Development for healthcare and industry
	Minerals	Seabed mining	Demand for minerals
	Energy	Oil and gas Renewables	Demand for alternative energy sources
Commerce and trade in and around the oceans	Transport and trade	Shipping	Growth in seaborne trade; International regulations
		Port infrastructure and services	
	Tourism and recreation	Tourism Coastal Development	Growth of global tourism Coastal urbanization Domestic regulations
Response to ocean health challenges	Ocean monitoring and surveillance	Technology and R&D	R&D in ocean technologies
	Carbon Sequestration	Blue Carbon	Growth in coastal and ocean protection and conservation activities
	Coastal Protection	Habitat protection and restoration	
	Waste Disposal	Assimilation of nutrients and wastes	

Table 3-1 The Components of Blue Economy. (World Bank, 2016)

3.5.3 Economic Attribute of The Blue Economy

The idea of using the sea for economic benefit is not new at all. In particular, the island nations have benefited from their ocean resources for centuries, with marine uses and activities contributing significantly to their development and the overall economy. These include a wide range of marine sectors essential to current and future economic development, including fisheries, maritime transport and ports, coastal tourism, mineral resource exploitation and the marine ecosystems and resources that support them.

What is new, however, is the growing recognition of the critical role that the oceans have in sustainable economic development and, as a result, the increasing recognition of the need for better management and protection of the coastal and marine ecosystems and resources that form the fundamental basis for such development.

According to a recent study by the Organization for Economic Co-operation and Development (OECD 2016), the global ocean economy is valued at US\$1.5 trillion per

year, contributing around 2-3% of global gross domestic product (GDP). Marine services, such as tourism and shipping, provide the largest share (US\$880 billion), followed by sectors categorized as marine resources (US\$377 billion) and marine manufacturing (US\$107 billion). Globally, around 350 million jobs are linked to the oceans through fisheries, aquaculture, coastal and marine tourism, and research activities. In addition, over one billion people depend on fish as their main source of protein (OECD 2012) (see Figure 3.3) (Roberts & Ali, 2016)

The OECD projects rapid growth in ocean-related economic activity, with ocean industries having the potential to outperform the growth of the global economy, both in terms of value-added and employment. Their predictions suggest that by 2030 the ocean economy could more than double its contribution to global value-added, reaching over US\$3 trillion per year. (Rayner, et al., 2019) , with growth driven mainly by aquaculture, offshore wind energy, fish processing, and shipbuilding and repair. (Steven, et al., 2019)

Worldwide, the data on the Blue Economy are impressive and are supported by a series of recent reports on Australia (2016), Europe, the USA (2016), China, Africa (2016), and Small Island Developing States (SIDs) (Roberts & Ali, 2016). (Steven, et al., 2019) For example, the US National Ocean Economy Program (NOEP) estimated, in 2010, that the ocean economy included more than 2.7 million jobs and contributed over \$258 billion (1.8%) to the United States' GDP. In the case of China, it is estimated that the ocean economy contributed US\$962 billion (10% of GDP) in 2014, employing 9 million people, while in the case of Indonesia, the ocean economy contributed 20% of GDP, comparable to other lower-middle-income countries with large ocean territories. (Economist Intelligence Unit, 2015) (Roberts & Ali, 2016)

As a result, the emerging concept of the blue economy has gained a great deal of prominence since 2012 as a mechanism for realizing sustainable growth centered on an ocean-based economy (Anon, 2014) and many countries are using the 'blue economy' as a policy tool or instrument to promote economic growth and job creation. (Wenhai, et al., 2019)

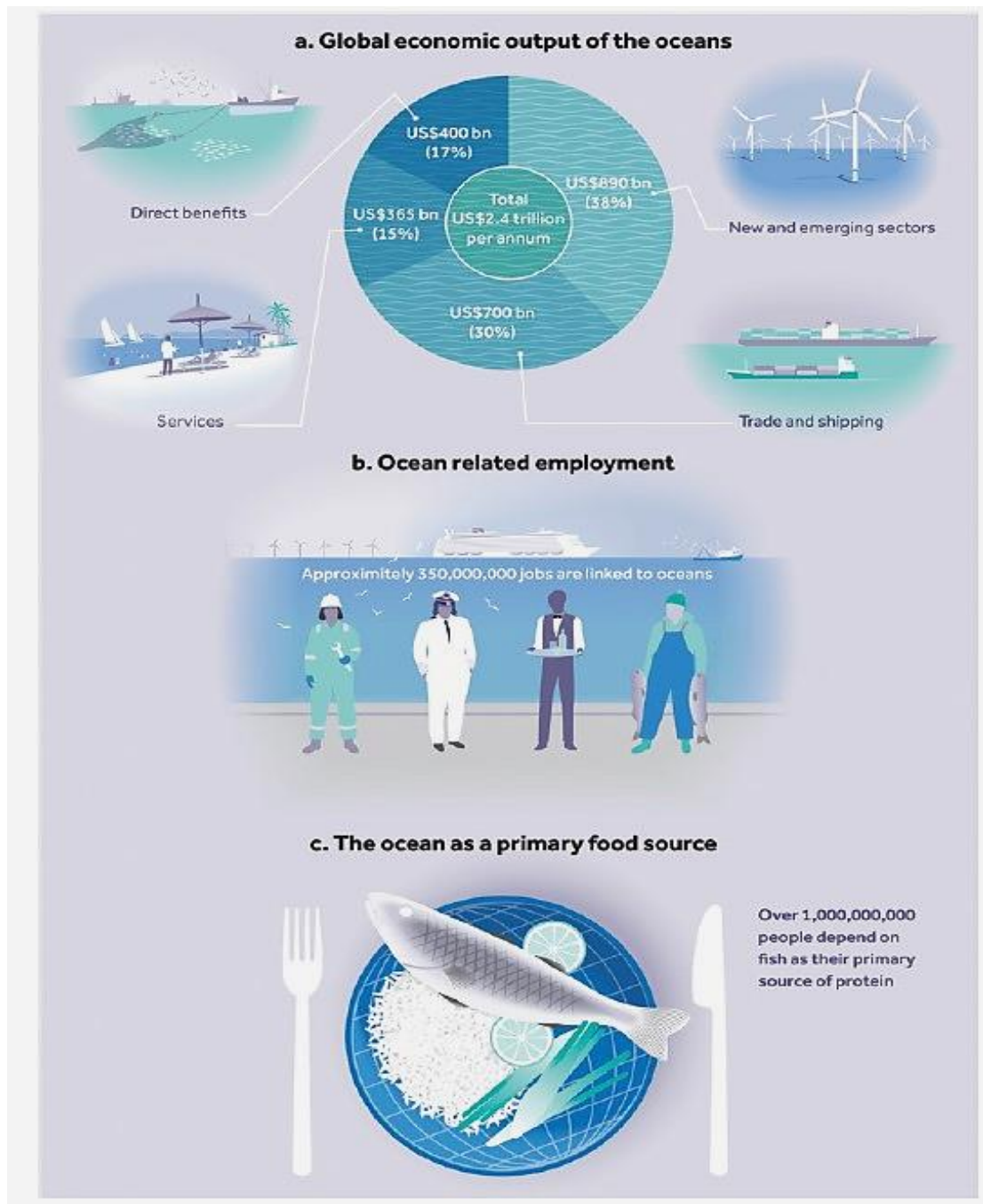


Figure 3-3 Contribution of the ocean to global economic development. (WWF, 2015)

4. SUSTAINABLE DEVELOPMENT

4.1 Meaning of sustainability

The blue economy includes economic, social, and environmental benefits and is therefore considered an alternative development paradigm. (Attri V. N. & Bohler-Muller N., 2018) (Steven, et al., 2019) However, the concept of the blue economy does not replace the concept of sustainable development but instead can be understood as a way to achieve sustainable development.

In 1983, the United Nations created the World Commission on Environment and Development to study the connection between ecological health, economic development, and social equity. The commission then published 1987 the Brundtland report, entitled "Our Common Future," which has become the standard in defining sustainable development. According to that report sustainable development, or the blueprint for attaining sustainability, is the ability of current generations to satisfy their current needs using natural resources in a way that does not endanger future generations to meet their own. (Brears, 2021) (Wenhai, et al., 2019) (Brundtland, 1987) (EC, 2019a)

Sustainable development implies that economic development is both inclusive and environmentally sound. Composed of three pillars, sustainable development seeks to achieve, in a balanced way, economic, social and environmental sustainability in relation to oceans. (Griggs, et al., 2013) (Lee, et al., 2020)

Economic sustainability

Weak sustainability essentially assumes that natural and manufactured capital are substitutes and that there are no essential differences between the kinds of wealth they create: the only that matter is the total value of the overall capital stock, which should at least be maintained or ideally increased for the benefit of future generations. Moreover, the economy will constantly produce technical solutions to the environmental problems caused by increased levels of production of goods and services.

In contrast, strong sustainability sees natural capital as a complex system consisting of evolving biotic elements in ways that determine the ecosystem's capacity to provide ecosystem services. In this framework, strong sustainability advocates state that natural capital is non-substitutable, as natural capital cannot be reproduced. Its destruction is irreversible, unlike industrial capital which can be reproduced and restored. (Pelenc, et al., 2015) (Brears, 2021)

Social sustainability

A society that is unjust is unlikely to be environmentally or economically sustainable. Social tensions are likely to undermine citizens' recognition of both their environmental rights and their obligations regarding environmental degradation.

Hence, a better understanding of the concept of the social viability of sustainable development is crucial to reconciling the competing demands of the tripartite society-environment-economy relationship. (Vallance, et al., 2011) (Brears, 2021)

Environmental Sustainability

Environmental sustainability is the ability to maintain and improve the qualities of the natural environment, i.e., to maintain living conditions for humans and other species.

In particular, environmental sustainability aims to protect the integrity of natural ecosystems and the various ecosystem services that are essential for human survival.

There are four types of ecosystem services provided by nature:

- The Provisioning services that are products taken from ecosystems,
- The Regulating services which are benefits derived from the regulation of ecosystem processes,
- The Supporting services that are necessary for the continuation of the three types of ecosystem services mentioned above, and
- The Cultural services, which are non-material benefits obtained from ecosystems such as religious, spiritual, recreational, and educational

(R.C. Brears, 2017) (EC, 2020) (Brears, 2021)

The need to balance these three dimensions of sustainable development in relation to oceans is a key component of the blue economy. (World Bank, 2017) (Lee, et al., 2020)

Figure 4.1 presents five components of the Blue Economy which are ecosystem resilience, economic sustainability, community engagement, institutional integration,

and technical capacity. Ecosystem resilience, economic sustainability and community engagement derive directly from the roots of the Blue Economy in the sustainable development literature and are listed as key components. Institutional arrangements and technological capacity are considered components of the Blue Economy because they can facilitate the achievement of ecological, economic, and social sustainability. Overall, and as illustrated in Figure 4.1, it is clear that the Blue Economy concept is an extension of the sustainable development framework, but with a greater focus on the ocean. (Keen, et al., 2018)

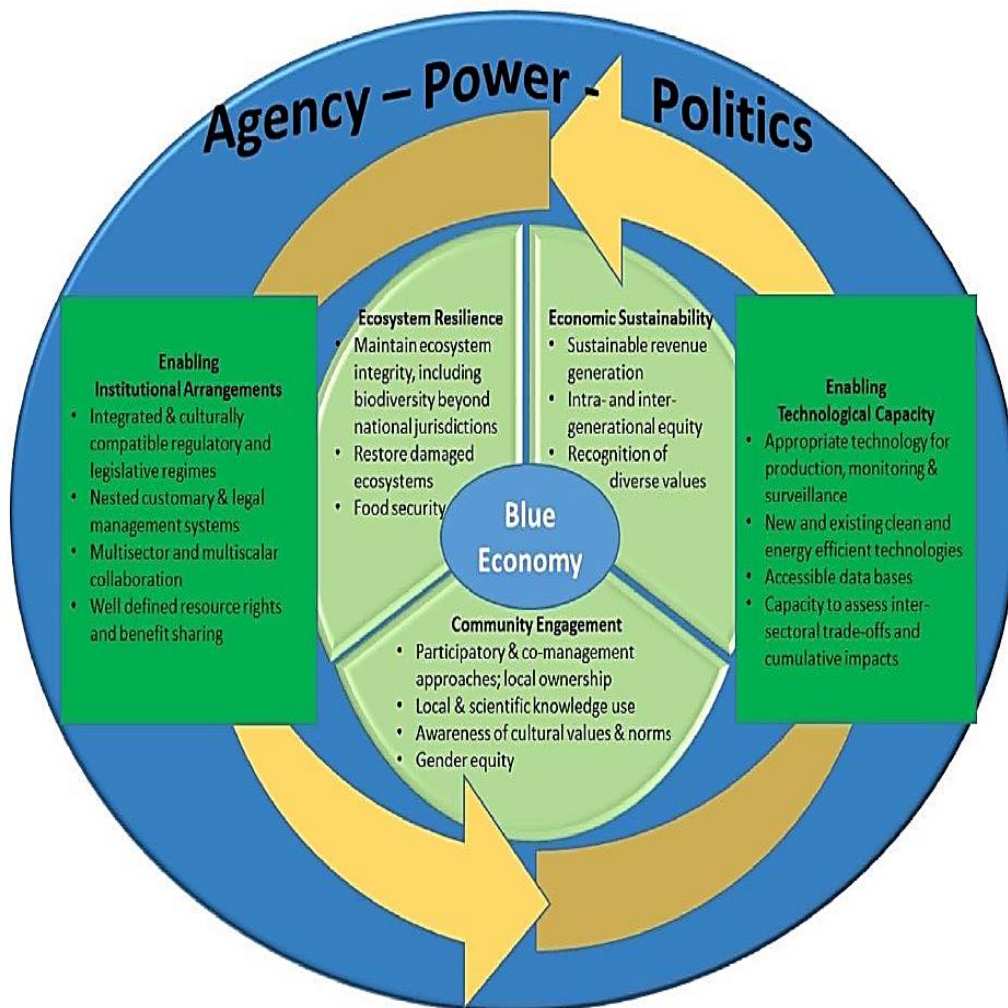


Figure 4-1 Representation of the core components of the Blue Economy. (Keen, et al., 2018)

However, it is not easy to reach a balance in practice given that the conditions of the oceans have drastically declined due to human and industrial activities and often conflicting goals, ranging from pollution to unsustainable fishing and biological degradation. The scientists and experts who prepared the First Global Integrated Marine Assessment (also known as the World Ocean Assessment) warned that the world's oceans face major pressures simultaneously with such great impacts that the limits of their carrying capacity are being reached—or in some cases have been reached—and that delays in implementing solutions to the problems that have already been identified as threatening to degrade the world's oceans will lead, unnecessarily, to greater environmental, social, and economic costs. (World Bank & UNDESA, 2017) (UN, 2016) (Lee, et al., 2020)

4.2 The Sustainable Development Milestones (Historical Brief)

The first reference to sustainability appeared at the United Nations Conference on the Human Environment (Stockholm Conference) in 1972, where defined its environmental pillar. This conference is considered the first major of the United Nations on international environmental issues and marked a turning point in the development of international environmental politics. The Conference also created the United Nations Environment Programme (UNEP) the first UN program focused solely on environmental issues. (UN, 1973)

In 1987, the World Commission on Environment and Development worked on a report on the environment and proposed strategies for sustainable development. The Brundtland Report (Our Common Future) was first introduced the need for the integration of economic development, natural resources management and protection, and social equity and inclusion. (Brundtland, 1987)

In June 1992, the second United Nations Conference on Environment and Development (UNCED), also known as the Earth Summit was held in Rio de Janeiro, Brazil. This conference clearly identified the economic pillar, recognized the importance of sustainable ocean development, and drew up a comprehensive action plan on the general actions needed to achieve a sustainable development plan. This plan of action, called Agenda 21 and was adopted by more than 178 countries. (UNCED, 1993)

In 1993 the General Assembly established the Commission on Sustainable Development (CSD). This Commission considered the high-level political body of the United Nations, delegated with the monitoring and promotion of the implementation of the Rio outcomes, including Agenda 21. (UN, 2013)

The Millennium Summit, held in September 2000 at UN Headquarters in New York, was, at that time, the largest gathering of heads of state and government of all time. The Summit concluded with the adoption by the 189 Member States of the Millennium Declaration and led to the elaboration of eight Millennium Development Goals (MDGs) to reduce extreme poverty by 2015.

1. Eradicate extreme poverty and hunger
2. Achieve universal primary education
3. Promote gender equality and empower women
4. Reduce child mortality
5. Improve maternal health
6. Combat HIV/AIDS, malaria, and other diseases
7. Ensure environmental sustainability
8. Develop a global partnership for development

The World Summit on Sustainable Development, held in Johannesburg in 2002, marked the social pillar, setting the final definition of sustainability and advanced the mainstreaming of the three dimensions of sustainable development in development policies at all levels through the adoption of the Johannesburg Plan of Implementation (JPOI). (Eikeset, et al., 2018) The third UN Conference brought together tens of thousands of participants, including heads of State and Government, national delegates and leaders from non-governmental organizations (NGOs), businesses and other major groups to focus the world's attention and direct action toward meeting difficult challenges, including improving people's lives and conserving our natural resources in a world that is growing in population, with ever-increasing demands for food, water, shelter, sanitation, energy, health services and economic security. (UN, 2002)

Twenty years after the 1992 “Earth Summit” in Rio de Janeiro, the 2012 United Nations Conference on Sustainable Development in Rio (also known as Rio+20) resulted in a

focused political outcome document containing clear and practical steps for the implementation of sustainable development.

Member States adopted the outcome document "The Future We Want" in which they decided, inter alia, to launch a process to develop a set of Sustainable Development Goals (SDGs), building on the Millennium Development Goals (MDGs) and converging with the post-2015 development agenda. The international community further decided also to establish a High-level Political Forum on Sustainable Development to subsequently replace the Commission on Sustainable Development.

The Conference also adopted innovative guidelines on green economy policies and put in place a strategy for financing sustainable development. Governments adopted a 10-year framework of programs on sustainable consumption and production patterns. (A/CONF.216/5). It also took forward-looking decisions in several thematic areas, including energy, food security, oceans, and cities, and decided to convene a third international conference on small island developing States in 2014. The Rio+20 Conference caught the attention of thousands from the UN system and beyond.

(UN, 2012)

The 2015 was a landmark year for multilateralism and international policy shaping, with the adoption of several major agreements:

- ✓ Sendai Framework for Disaster Risk Reduction (March 2015)
- ✓ Addis Ababa Action Agenda on Financing for Development (July 2015)
- ✓ Transforming our world: the 2030 Agenda for Sustainable Development with its 17 SDGs was adopted at the UN Sustainable Development Summit in New York in September 2015.
- ✓ Paris Agreement on Climate Change (December 2015)

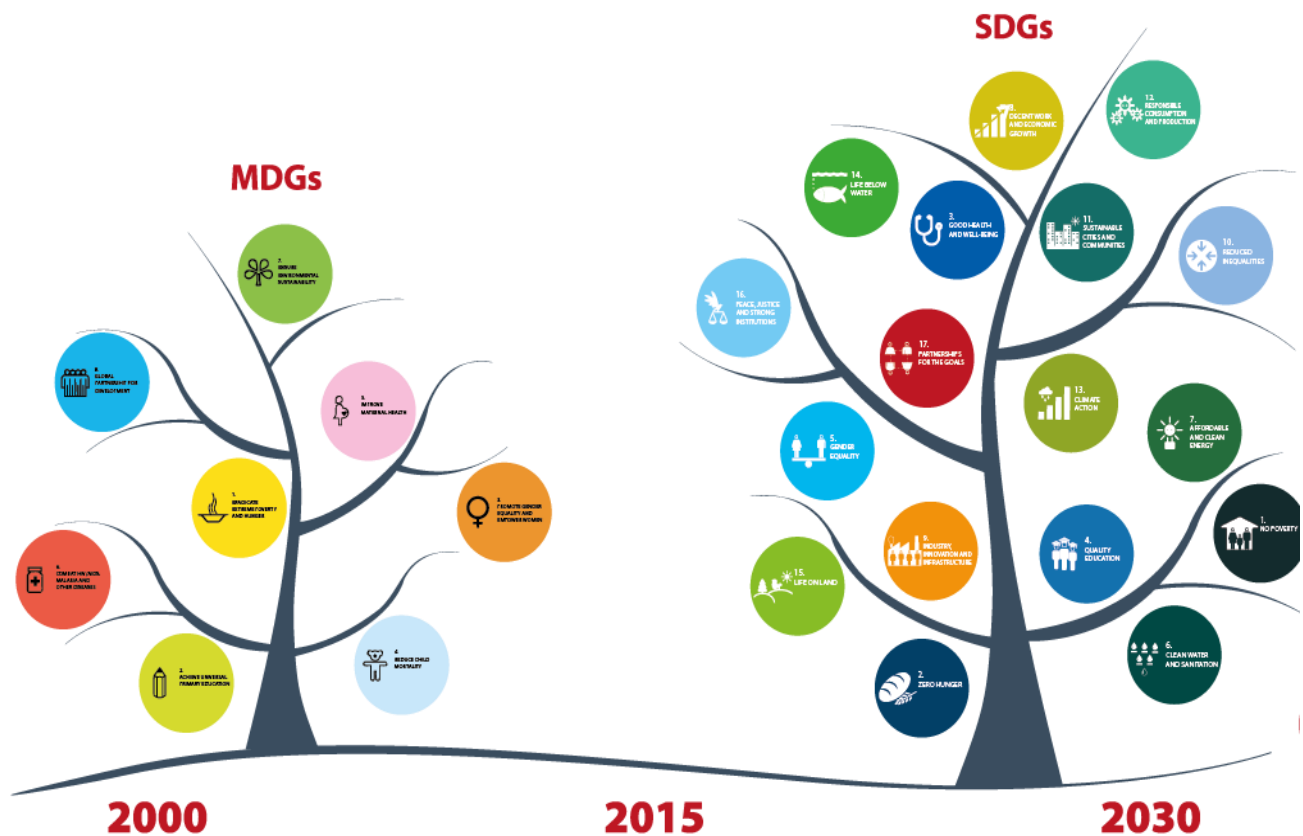


Figure 4-2 Evolution of SDG's (UN, 2002)

Transforming our world: the 2030 Agenda for Sustainable Development

On 25 September 2015, the 193 Member States of the United Nations General Assembly adopted the universal, integrated, and transformative 2030 Agenda for Sustainable Development. The 2030 Agenda is the world's first global agreement to provide a comprehensive agenda for action to support transformations towards social, economic and environmental sustainability. (Virto, 2018)

More than 150 world leaders gathered at United Nations Headquarters in New York to formally approve an ambitious new agenda for sustainable development. This new plan, called Transforming Our World: The 2030 Agenda for Sustainable Development by 2030, included a declaration, a set of 17 Sustainable Development Goals and 169 associated targets.

The goal of the plan was to find new ways to improve the lives of the world's people, eradicate poverty and hunger, promote prosperity and well-being for all, protect

the environment, and to fight against climate change. The agenda further aims to combat inequalities, build peaceful, just and inclusive societies, protect human rights and promote gender equality and the empowerment of women and girls, and to ensure the lasting protection of the planet and its natural resources. Targets are defined as aspirational and global, with each government setting its own national targets guided by the global level of ambition but considering national circumstances. Each government will also decide how these aspirational and global targets should be incorporated into national planning processes, policies, and strategies. (UN, 2015)

These UN SDGs are a political expression, they cover all areas where humanity's activities have occurred, and are strongly interdependent with each other to ensure a safe, just and sustainable planet for all. (Singh, et al., 2017) (Ntona M. and Morgera E., 2018)

First UN Ocean Conference (2017, New York)

The high-level United Nations Conference to Support the Implementation of Sustainable Development Goal 14: Conserve and sustainably use the oceans, seas, and marine resources for sustainable development was convened at United Nations Headquarters in New York in June 2017, coinciding with World Oceans Day, to support the implementation of Sustainable Development Goal 14.

The aim of the Conference was to be the game-changer that will reverse the decline in the health of our ocean for people, the planet, and prosperity. It was focused on solutions with the participation of all stakeholders and aimed, inter alia, at:

- Identifying ways and means to support the implementation of Sustainable Development Goal 14
- Building on existing successful partnerships and stimulating innovative and concrete new partnerships to advance the implementation of Goal 14
- Involving all relevant stakeholders, from Governments, the United Nations, intergovernmental organizations, international financial institutions to non-governmental organizations, academic institutions, and the scientific community in order to assess challenges and opportunities relating to SDG 14
- Sharing the experiences gained at the national, regional, and international levels

- Contributing to the follow-up and review process of the 2030 Agenda for Sustainable Development by providing an input to the high-level political forum on sustainable development.

The Conference raised global consciousness on ocean issues, and produced strong ambitious outcomes, including an intergovernmental agreed political declaration “Our ocean, our future: call for action”, to advance the implementation of SDG 14 and related targets. (UN, 2019) (UN, 2016) (Marjo Kristina Vierro, 2021)

Second UN Ocean Conference (2022, Lisbon) *2022 United Nations Conference to Support the Implementation of Sustainable Development Goal 14: Conserve and sustainably use the oceans, seas, and marine resources for sustainable development.*

As discussed in a previous chapter, the ocean faces significant threats because of human activities. Its health and its ability to sustain life will only get worse as the world population and human activities increase. If we are to address some of the most defining issues of our time, such as climate change, food insecurity, disease and pandemics, biodiversity loss, economic inequality, and even conflict and strife, we must act now to protect the state of our ocean.

The forthcoming Ocean Conference, co-hosted by the governments of Kenya and Portugal, comes at a critical time as the world is trying to address many of the deep-rooted problems in our societies revealed by pandemic COVID-19, which will require major structural changes and common shared solutions rooted in the SDGs. To mobilize action, the Conference will seek to promote much needed science-based innovative solutions to launch a new chapter of global ocean action.

We must conserve and sustainably use the oceans, seas and marine resources for sustainable development. The overarching theme of the Conference is "Scaling up ocean action based on science and innovation for the implementation of Goal 14: stocktaking, partnerships and solutions". Solutions for sustainable ocean management include green technology and innovative uses of marine resources as well as addressing threats to the health, ecology, economy and governance of the ocean. (UN, 2019) (UN, 2021)

Stockholm+50, 2022 (2nd and 3rd of June 2022)

The upcoming international environmental meeting, Stockholm+50, will be held on June 2022 in Stockholm, Sweden under the theme “Stockholm+50: a healthy planet for the prosperity of all – our responsibility, our opportunity”. Stockholm+50 will commemorate the 1972 United Nations Conference on the Human Environment and celebrate 50 years of global environmental action.

By recognizing the importance of multilateralism in tackling the Earth’s triple planetary crisis – climate, nature, and pollution – the purpose of this event is to contribute to the environmental dimension of sustainable development and to act as a springboard accelerate the implementation of the UN Decade of Action to deliver the Sustainable Development Goals (SDGs), including the 2030 Agenda, Paris Agreement on climate change, the post-2020 global Biodiversity Framework, and encourage the adoption of green post-COVID-19 recovery plans. (UN, 2022) (UN, 2021)

Thus, Stockholm+50 presents an opportunity for co-creation and a multistakeholder approach to accelerate implementation in the coming decade in areas fundamental to a sustainable future: the relationship between humans and nature, what we invest in, and how resources are used and shared.

4.3 Sustainable Development Goal 14 For Oceans



The Sustainable Development Goals (SDGs)

As discussed earlier in this chapter, the 2030 Agenda is the world's first global agreement to provide a comprehensive agenda for action in order to support transformations toward social, economic, and environmental sustainability. (Unger, et al., 2017) (Virto, 2018) These triple pillars reflect the Sustainable Development Goals (SDGs), which are now the primary instrument framing the international policy context. (Steven, et al., 2019)

The SDGs and related 17 goals, 169 targets, and 232 indicators, adopted in 2015 by the 2030 Agenda, result from a multistakeholder agreement between countries, designed to reduce unsustainability and promote sustainable development globally. (UN, 2018) (Lee, et al., 2020)

The 17 SDGs stimulate action in areas of critical importance for humanity and the planet, including poverty eradication, food security, health, education, gender equality, access to water, sanitation, clean energy, decent jobs, key infrastructure, strong institutions, inequality reduction, sustainable urbanization, responsible production and consumption patterns, climate change mitigation and adaptation, and ecosystem conservation.



They represent, hence, a universal, comprehensive, and transformative vision for a better world and constitute the global development strategy for the next years (until 2030), calling for the current growth-based economic model to give way to a new path that creates sustainable and equitable economies and societies worldwide and ensures greater public participation in decision-making. These SDGs are flexible for each national government to set their own target and incorporate them into their national processes, policies, and strategies. (Cormier & Elliott, 2017)



Sustainable Development Goal 14: Life Below Water

The unique importance of the ocean and the challenges it faces are reflected in SDG14 and is called 'Life Below Water. Adopted in 2015 as an integral aspect of the 2030 Agenda for Sustainable Development and its set of 17 transformative goals, SDG14 aims “To conserve the oceans, seas and its resources and ensure their sustainability use for sustainable development”. (Steven, et al., 2019)

Advancement of Goal 14 is guided by 10 specific targets (7 targets and 3 sub-targets) which focus on an array of ocean issues, including reducing marine pollution, protecting marine and coastal ecosystems, minimizing acidification, ending illegal and over-fishing, increasing investment in scientific knowledge and marine technology, and respecting international law that calls for the safe and sustainable use of the ocean and its resources. These targets also cover environmental pressures on marine life due to economic activities. SIDS and coastal communities are particularly impacted by these environmental pressures as well as dependent on marine resources in socio-economic terms. (Virto, 2018)

Additionally, measuring and monitoring the progress of SDGs is vital and indicators play a very important role in this process, as what cannot be measured cannot be improved. Thus, the targets are tracked using 10 indicators that were developed by the interagency and expert group (IAEG) on SDG indicators for accurately measuring and monitoring the progress of various targets under the 17 SDGs. This set of indicators is an important component for reviewing the progress in achieving the SDGs at the global level and was adopted along with a global indicator framework by the 47th session of the United Nations Statistical Commission in March 2016 for closely monitoring the SDGs. (Vijay Sakhuja, 2017) A complete list of the targets of goal 14 is placed at table below.

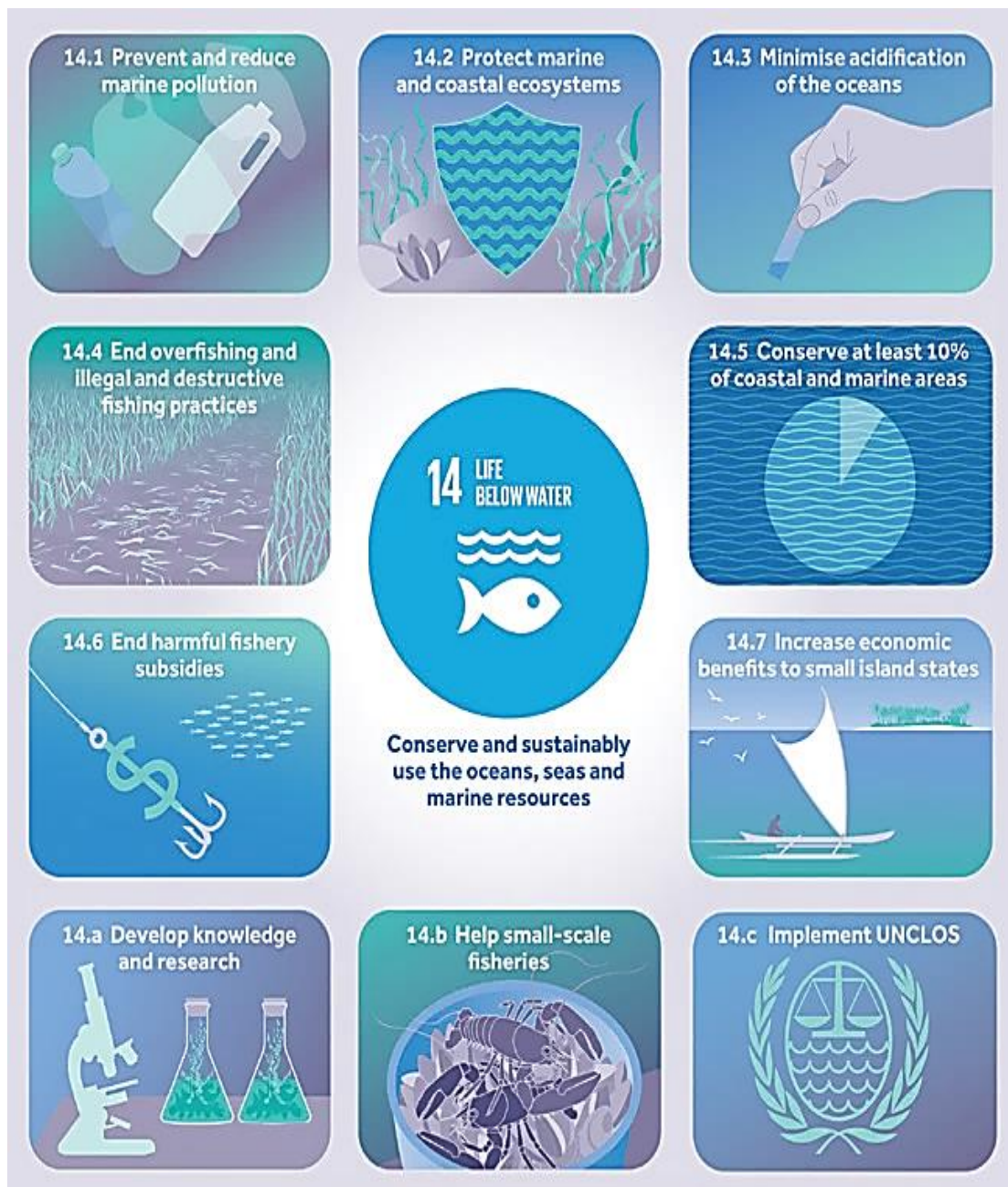


Figure 4-3 SDGs 14. (Roberts & Ali, 2016)

14.1
By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution.
14.2
By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans
14.3
Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels
14.4
By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics
14.5
By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information
14.6
By 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, eliminate subsidies that contribute to illegal, unreported, and unregulated fishing and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential treatment for developing and least developed countries should be an integral part of the World Trade Organization fisheries subsidies negotiation
14.7
By 2030, increase the economic benefits to small island developing States and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture, and tourism
14. a
Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular small island developing States and least developed countries
14. b
Provide access for small-scale artisanal fishers to marine resources and markets
14. c
Enhance the conservation and sustainable use of oceans and their resources by implementing international law as reflected in the United Nations Convention on the Law of the Sea, which provides the legal framework for the conservation and sustainable use of oceans and their resources, as recalled in paragraph 158 of “The future we want”

Table 4-1 SDG 14 targets (UN, 2015a)

5. THE BLUE ECONOMY SECTORS

The Blue Economy expands on the oceans and seas, lakes and rivers and utilizes the outputs for consumption and as a source of economic growth in a sustainable way.

According to the annual economic report on EU Blue Economy that took part in Brussels in 2018, there is a separation between established and developing sectors of the Blue Economy. The common understanding sectors of the Blue Economy are the below:

- Fishery and Aquaculture
- Maritime Transportation, Shipping/Ports
- Coastal Tourism and Cruise Ship Industry
- Marine Biotechnology
- Seawater Desalination
- Deep Sea Mining, Offshore oil/gas
- Renewable Energy
- Ship and Boatbuilding
- Maritime Construction
- Defense and Security
- Research and Education

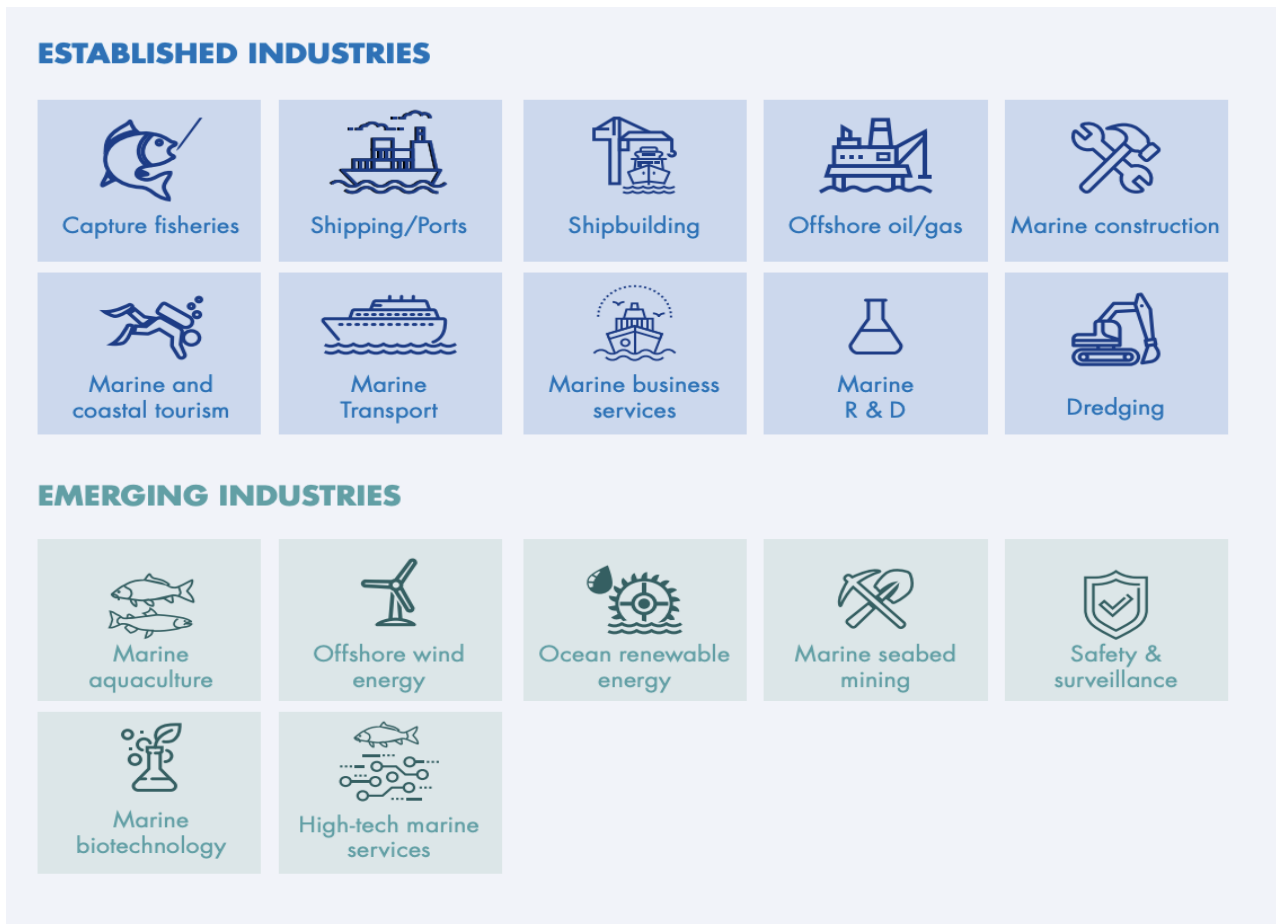


Figure 5-1 Established and Emerging Blue Economy Industries (Hub, 2015)

Based on the European Commission's 2019 annual report on the blue economy, the established sectors of the blue economy include fishery, aquaculture, coastal tourism, maritime transport, port activities, shipbuilding and repair, marine oil & gas, and mineral extraction. In 2017, the established sectors directly employed over 4 million people (7,2 % increase compared to 2009) and accounted for a gross value added (GVA) of EUR 180 billion (8 % increase compared to 2009). In terms of contribution to the overall EU economy, these figures represented respectively 1,8 % of total EU employment and 1,3 % of EU GDP.

The emerging sectors are offshore wind and ocean energy, blue biotechnology, seabed mining, and desalination. Some specific sectors such as instance maritime defense, coastal protection and underwater cultural heritage are not included.

As regards blue biotechnology, 2014 estimates for the sector as a whole range between 11.500 and 40.000 jobs while the algae subsector, shown in this graph, currently

represents about 17.000 jobs. Regarding the seabed mining, no commercial EU exploitation exists, only a limited number of jobs in research and development. (EU, 2019)

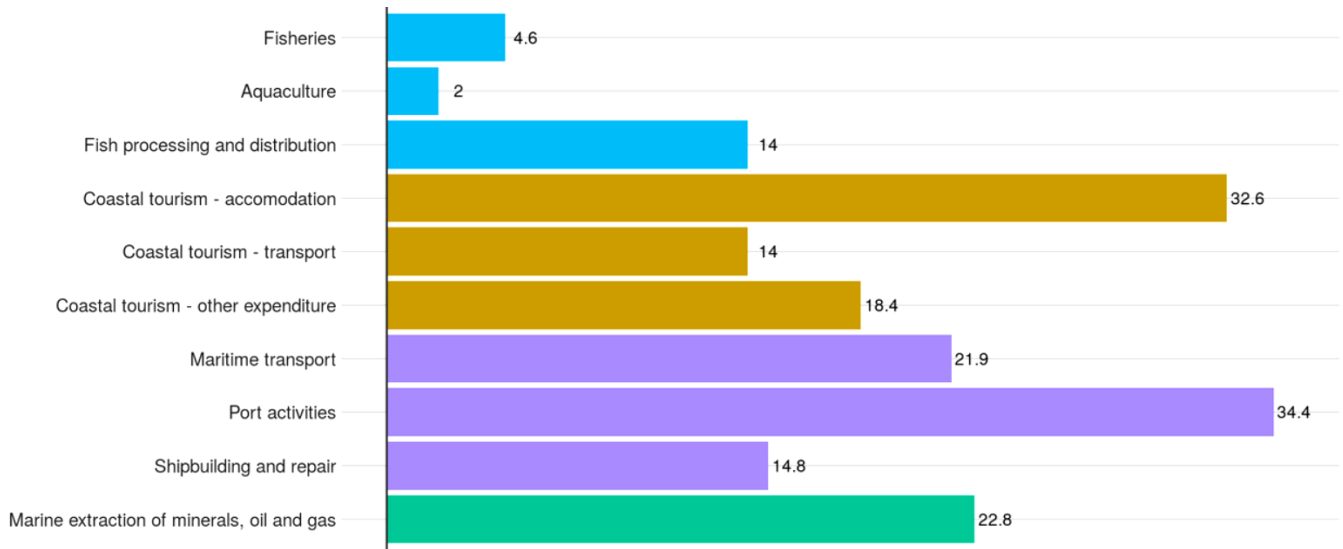


Figure 5-2 Gross value added (in billion euro, established sectors only) by EU blue economy sector (EU, 2019)

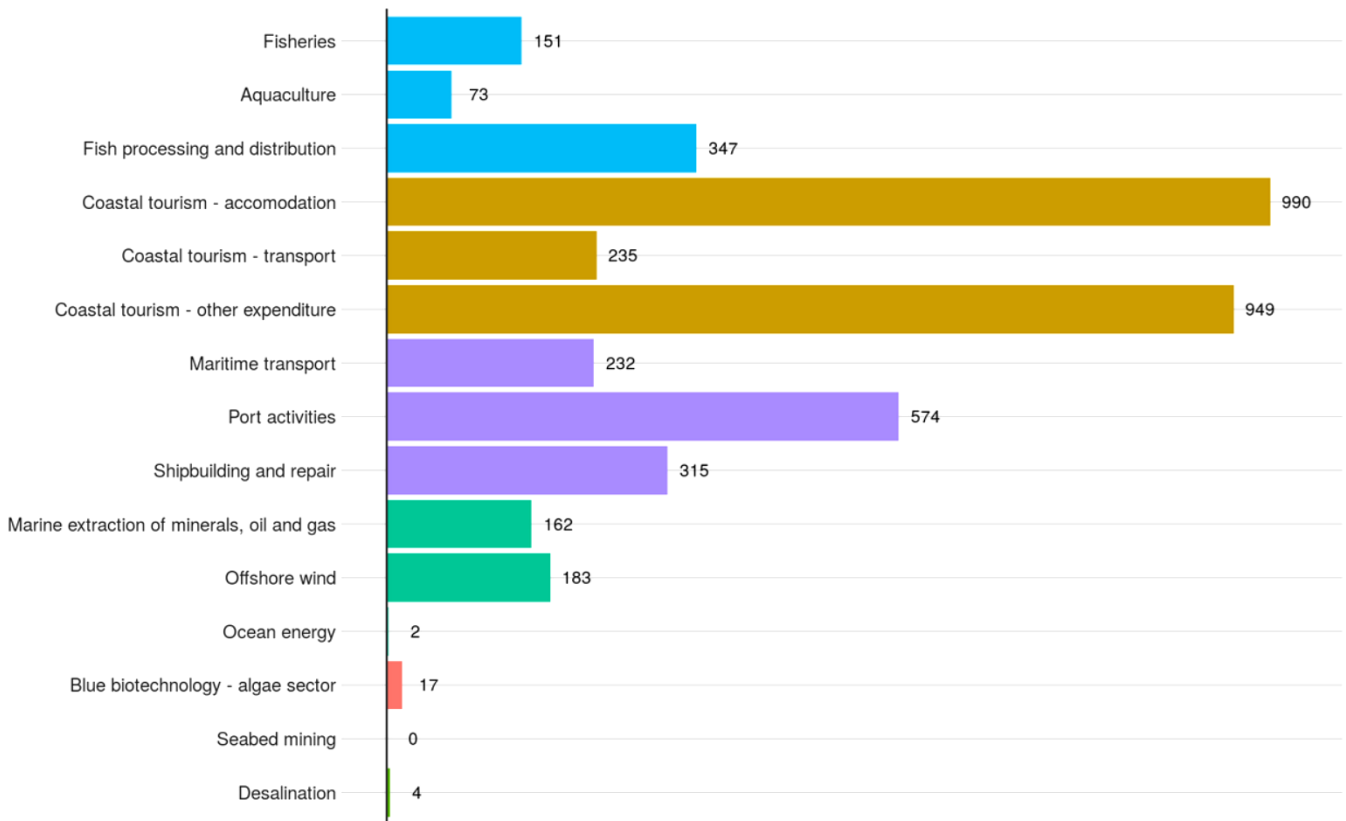


Figure 5-3 Number of people employed (thousands) by EU blue economy sector (EU, 2019)

5.1 Fisheries



Figure 5-4 Fisheries, Source: <https://www.theindependentbd.com/magazine/details/169135/Blue-Economy>

Fishing consists of one of the oldest blue economy sectors, while the other is shipping. Fishing has its roots in prehistory and remains dominant today in its spatial and social impacts. For centuries it has been the cornerstone of the Blue Economy. Lately, it has been less important in terms of monetary value compared to other marine industries such as offshore oil and tourism. But fishing remains extremely important in terms of employment and livelihoods for coastal communities everywhere. It is the largest marine employer by an order of magnitude, more than five times its nearest competitor (OECD, 2016). Arguably, it has the greatest impact on the environment.

The ancient rights of individuals to sail and fish in the oceans and seas are threatened by overfishing, illegal fishing, market competition from farmed fish, and spatial exclusion due to new industries and conservation areas.

Fish are an important source of animal protein and thus contribute to the world's diet. Fish consumption exceeded the average of 20 kg per person per year for the first time in 2014, although the recent increase in consumption has been entirely supported by aquaculture. Wild fish consumption has stabilized at an annual rate of around 10 kg per person. Farmed fish consumption has soared from 0 kg in 1974 to about 10 kg or just over 50% of total consumption in 2014. Fish contribute more than 20% of the protein

in the diet of the food chain (FAO, 2016). Being the largest marine employer, the social importance of capture fisheries far exceeds its commercial importance.

Fishing has a relatively low economic weight compared to other marine activities, with a GVA of €4.6 billion in 2017, i.e., 2.6% of the total GVA of the established sectors of the blue economy.

European Parliament Data (EU, 2019)

According to the annual economic report on the EU fishing fleet (EU, 2016), 151.981 fishermen were directly employed in EU fisheries in 2017, corresponding to 107.807 full-time equivalents (FTE). The small-scale fleet employed 76.801 fishermen (51% of the total), while 68.849 fishermen (45% of the total) worked in the large-scale fleet and 6.222 fishermen (4% of the total) in the distant-water fleet. Since 2008, total employment in the EU fleet (in FTE) has decreased (EU, 2019) on average by 1,3% per year, partly due to the reduction in fleet capacity. However, at a regional level, employment has increased in some fleets in the North Sea and the Atlantic, in contrast to other regions. The average annual FTE salary in the EU increased by 2,7% per year, reaching €28.652 in 2017.

EU marine fisheries production reached almost 5.3 million tons in 2017, with a total value reported at €7.3 billion. The Spanish fleet accounted for 26 % of the total value landed, followed by France (17%), the United Kingdom (13.6%), and Italy (12%). 75% of all EU catches were taken in the North-East Atlantic. Atlantic mackerel was the top species landed by value, followed by European cod, yellowfin tuna, Norway lobster, and Atlantic herring.

Overall, fishing is a profitable activity in the EU, recording a net profit of €1.3 billion in 2017. Profits have increased in recent years, mainly due to higher average fish prices and continued low fuel prices, while improvements in the state of some important stocks and technological advances have also contributed. However, there are marked variations by fleet segment and sea basin. Losses, as the Member States, were recorded for Finland, Germany, Malta, and Lithuania. In December 2018, the EU fleet register numbered 81.644 vessels, with a total capacity of 1.533.180 in gross tonnage (GT) and 6.075.634 in kilowatts (kW). In recent decades, the capacity of the EU fishing fleet has declined both in terms of tonnage and engine power, a decline that has continued in recent years, albeit at a slower rate. However, a significant number of fleet segments

(190 out of 255 assessed) are still out of balance with their fishing potential. Fishing's sector economic performance is expected to continue to improve as fish stocks recover and capacity continues to adjust, although the positive trend could be offset by rising fuel prices.

In the EU, the Common Fisheries Policy (CFP), launched in 1983 and recently reformed in 2013, is designed to ensure the sustainability of EU fisheries, including the environmental, economic, and social dimensions. The CFP applies to the management of fisheries within EU waters, but also to the EU's international fisheries relations, including bilateral fisheries agreements with third countries. The EU has exclusive competence with regard to the conservation of its marine living resources, which is a key part of the CFP. With its reform in 2013, the CFP set ambitious targets in this respect. The current framework aims to achieve the exploitation of all stocks at sustainable levels by 2020, to implement multi-annual plans setting the framework or long-term management of stocks by fishing activity and sea basin, and to implement the discard ban through the obligation to land all catches applicable to all EU waters from 1 January 2019.

The implementation of the reformed CFP has been the key priority in recent years. There has been progress towards the objective of sustainability in the North-East Atlantic and adjacent seas, where exploitation levels are now, on average, close to maximum sustainable yield (MSY) and the proportion of stocks within safe biological limits has almost doubled from 35% (15 stocks) in 2003 to 78% (29 stocks) in 2017. In contrast, the state of stocks in the Mediterranean and the Black Sea remains very worrying, with an average exploitation level that suggests long-term overfishing at more than twice the level of the MSY level.

The implementation of the reform will continue, in particular, to develop new multi-annual plans and to effectively control and enforce the landing obligation. The revision of the fisheries control system, launched in May 2018, aims to improve the efficiency of the fisheries control system.

5.2 Aquaculture

With the world's population growing and poverty gradually disappearing, the world is looking for new sources of protein to ensure its nutritional balance. Aquaculture is a sector with great potential for increased protein production without overburdening the ecosystem.

(OECD/FAO, 2016) prediction indicates that future growth in seafood production will come from aquaculture. Aquaculture cannot be applied everywhere, even though 70% of the planet is made up of water. It requires a set of natural resources, social and economic resources, which must be used wisely if the development of this sector is to be sustainable. The availability of areas suitable for aquaculture is becoming a major problem for the development and expansion of the sector, both in the EU and throughout the world. Measures must be taken to manage existing aquaculture facilities and to create new production units in order to ensure that the appropriate environmental characteristics are maintained, and good water quality is preserved.

According to (FAO, 2018), global aquaculture fish production has been developed 3 times up in two decades: from 24 million tons to more than 76 million tons in 2015, reaching the volume of fisheries. However, EU aquaculture production has remained more or less stable over the same period, with a production volume of around 1.3 million tons, representing only 1.6% of global production of food fish in 2016.

The development of marine aquaculture is an opportunity for some of developing countries. Aquaculture can provide an additional source of income for vulnerable coastal populations who may otherwise rely on agriculture or fishing. Moreover, technical improvements in aquaculture systems have significantly increased the efficiency of aquaculture (Fry, et al., 2018). More complex and still in the demonstration stage, open ocean farming projects also have the potential for more sustainable fish production (OECD, 2019).

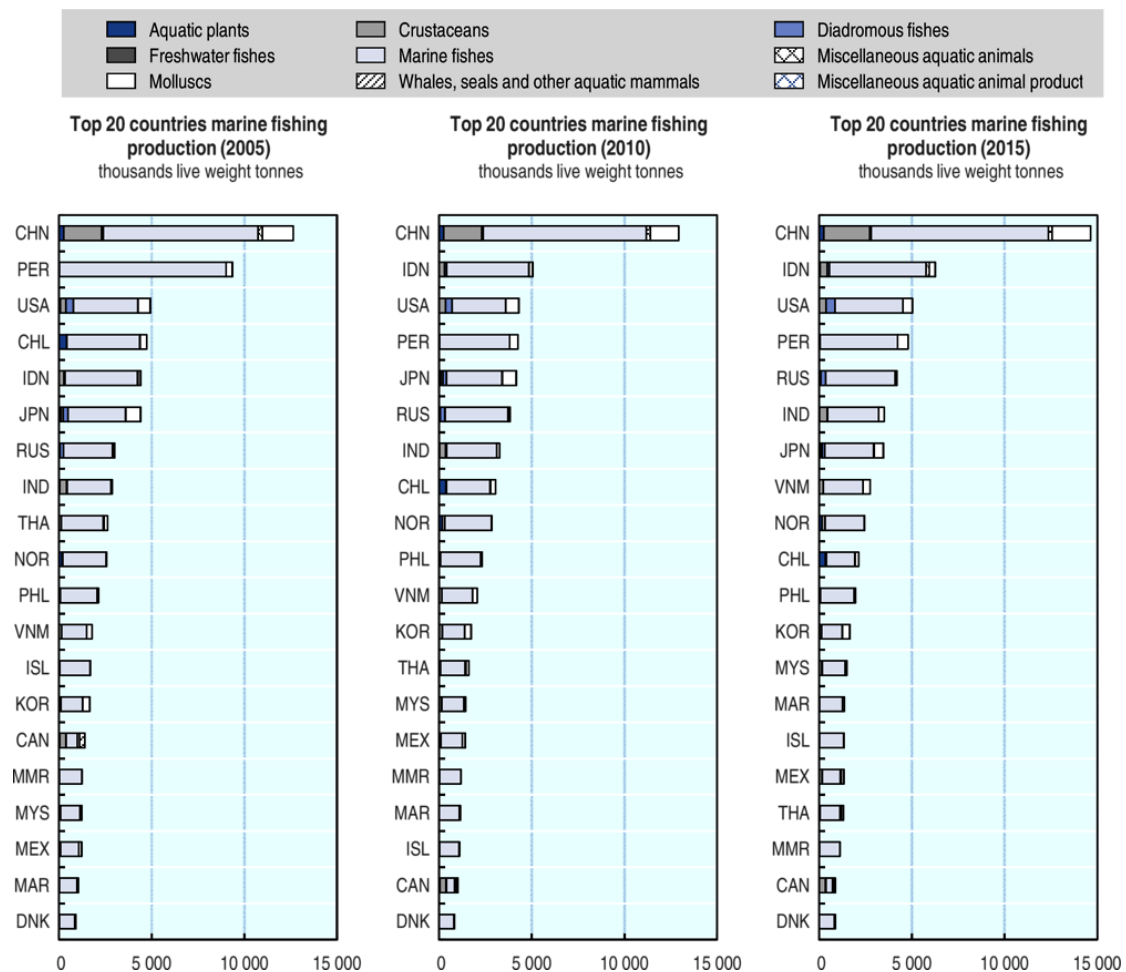


Figure 5-5 Top 20 countries in seafood production in live weight tonnes, 2005-15 (FAO, 2019)

European Parliament Data (EU, 2019)

According to (STECF-18-19, 2018) data, about 75.000 people and 12.500 businesses are directly employed in aquaculture. The main volume of production is spotted in five countries:

- Spain (21%)
- France (15%)
- Italy (14%)
- United Kingdom (14%)
- Greece (10%).

Aquaculture is divided in 3 sub-sectors: marine, shellfish and freshwater. Marine aquaculture is the largest sector in sales volume (51%), but on the other hand, has the lowest employment (13%). The most important marine fish species is salmon (of which

more than 91% of is farmed in the UK) and seabream and seabass [with Greece as the main producer. Greece represents 60 % of the sales volume, followed by Spain (25%) and Italy (7%)]. The shellfish sector is the most important in terms of jobs (50% of employees) with Spain and France as the main producers.

In freshwater aquaculture, the most important species are trout (Italy, Denmark and France are the main producers) and carp.

5.3 Seafood Processing

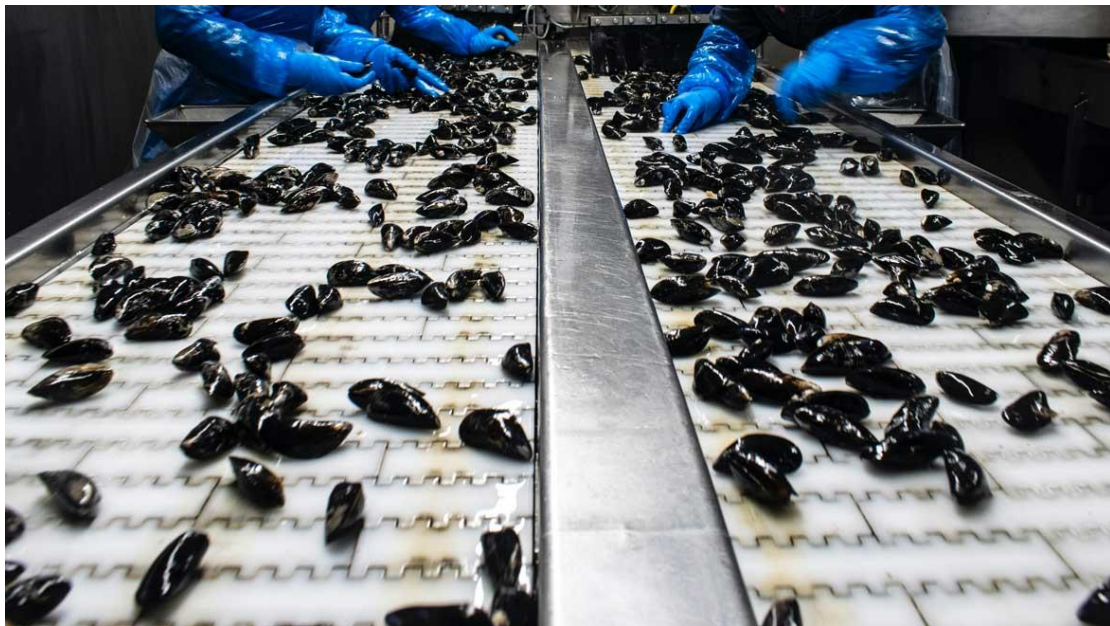


Figure 5-6 Seafood Processing, Source: <https://switchmed.eu/news/developing-a-blue-economy-in-moroccos-fish-processing-value-chain/>

Another important ocean-base industry, mostly in developing countries, is artisanal fish processing in which are occupied millions of people and particularly women. But often, there is a lack in post-harvest facilities such as drying equipment, ice plants and cold storage facilities. Such facilities are crucial for adding value to the seafood product and getting better prices, but also to reduce post-harvest losses. (Rosales, et al., 2017). When there are no storage facilities available in the ports with no ice, then sometimes the fishers tend to sell their unsold fish at cheaper price or face spoilage of their catches. According to (FAO, 2020), approximately 35% of the global harvest is either lost or wasted every year. Economic development across the entire fish production system is

therefore highly dependent on enhancing post-harvest processing, as well as exploring further sustainable fishing practices (such as certifications and eco-labels).

European Parliament Data (EU, 2019)

The processing sector refers to enterprises whose main activities are the processing and preservation of fish and fish products. This means the preparation and preservation (freezing, drying, cooking, smoking, salting, canning, etc.) and the production (fish fillets, caviar, etc.) of fish, crustacean and mollusk products. (STECF-17-16, 2018), the sector employs about 126.000 workers and 3.800 businesses in the EU and generates a gross added value of €6.1 billion. Spain and Italy have the highest number of enterprises (both 16 % of the EU total). The majority (57%) of the enterprises in the EU have fewer than 10 employees.

Investments in the processing of fishery and aquaculture products have received structural support, according to the Treaty of Rome in which fish products and products of first stage are considered agriculture products. Under the current EMFF (or European Maritime and Fisheries Fund), processing and marketing receives, via shared management, 17.5% of the overall EMFF budget. This also covers the marketing of non-processed fish and aquaculture products and support for storage aid and public funding for producer and inter-branch organizations and for the preparation and implementation of their production and marketing plans.

The processing sector is increasingly dependent on imports, as, despite growing demand for seafood, there is a stagnation in the supply of raw materials from the EU's primary sector (i.e., fisheries and aquaculture). This sector has low-profit margins due to rising raw material and energy costs. On the other hand, however, there is an increase in prices and economic benefits due to the growing demand for certified products on the part of consumers, which covers both raw materials and certification of processing.

5.4 Coastal and marine tourism including cruise shipping



Figure 5-7 Coastal and marine tourism, Source: https://www.bluesprout.eu/repo/docs/Coastal-and-maritime-tourism_en.pdf

Tourism is one of the major pillars of the global economy. In 2019 it accounted for 10.3% of global GDP and accounted for around 330 million jobs, or one in ten, jobs worldwide (WTTC, 2020). Globally, there has been significant growth, with an estimated 1.5 billion international arrivals in 2019, a 3.8% increase over the previous ten-year increase and well above forecasts (World Tourism Organization, 2019). Travel spending between 2000 and 2018 has more than doubled, from US\$495 billion to US\$1.5 trillion, and now accounts for 7% of global exports of goods and services. However, the COVID-19 crisis may have a lasting impact on the tourism sector, as the international tourism economy is expected to decline by up to 70% in 2020 (OECD, 2020).

According to (OECD, 2018), in 2016 tourism accounted for about 4% of GDP in OECD countries. But there are large regional differences in terms of countries' dependence on tourism for their economies. Tourism is the key economic sector in several developing countries and an important source of foreign exchange, income and jobs. The following are typical examples:

- In Kenya, tourism accounted for 8.8% of GDP in 2018 and attracted up to two million foreign visitors annually, mainly in national parks and along the coast.
- In Maldives, it contributes up to 40% of the national GDP. The contribution of direct and indirect tourism to GDP is over 50% in Cabo Verde and over 40% in

Antigua and Barbuda, Belize, St. Lucia and Fiji It represents 65% of GDP in Seychelles (Monnereau & Pierre, 2014).

Over time, coastal tourism can account for about 60% of revenue. SIDS (or Small Island Developing States) are also highly dependent on the tourism sector: two out of three SIDS rely on tourism for 20% or more of their GDP (OECD, 2018). As visitors are often concentrated along coastlines, some coastal regions generate up to 80% of the total GDP in some countries (Tonazzini, et al., 2019).

The quality of the natural ecosystems largely determines the attractiveness of visitors due to the recreational value of the beaches and clean waters. However, poorly managed tourism contributes to the degradation and fragility of ecosystems, jeopardizing the economic viability of the sector itself. Another risk of countries relying on tourism is their vulnerability to climate change. Typical examples are the bleaching of coral reefs, with the greatest risk in small island states, where tourism is also the largest sector of the national economy and the largest employer (Scott, et al., 2019). Other challenges affecting the sector include the degradation of beaches due to sand harvesting, deforestation of mangrove forests and the ever-increasing coastal population that puts pressure on coastal ecosystems.

Cruise shipping is an important sector of the tourism industry with continuous global growth. Small island countries are popular destinations for cruise ships (Figure 5.8). For example, 825,420 cruise passengers visited Antigua and Barbuda alone in 2018, an increase of 92% since 2000 (Eastern Caribbean Central Bank, 2018).

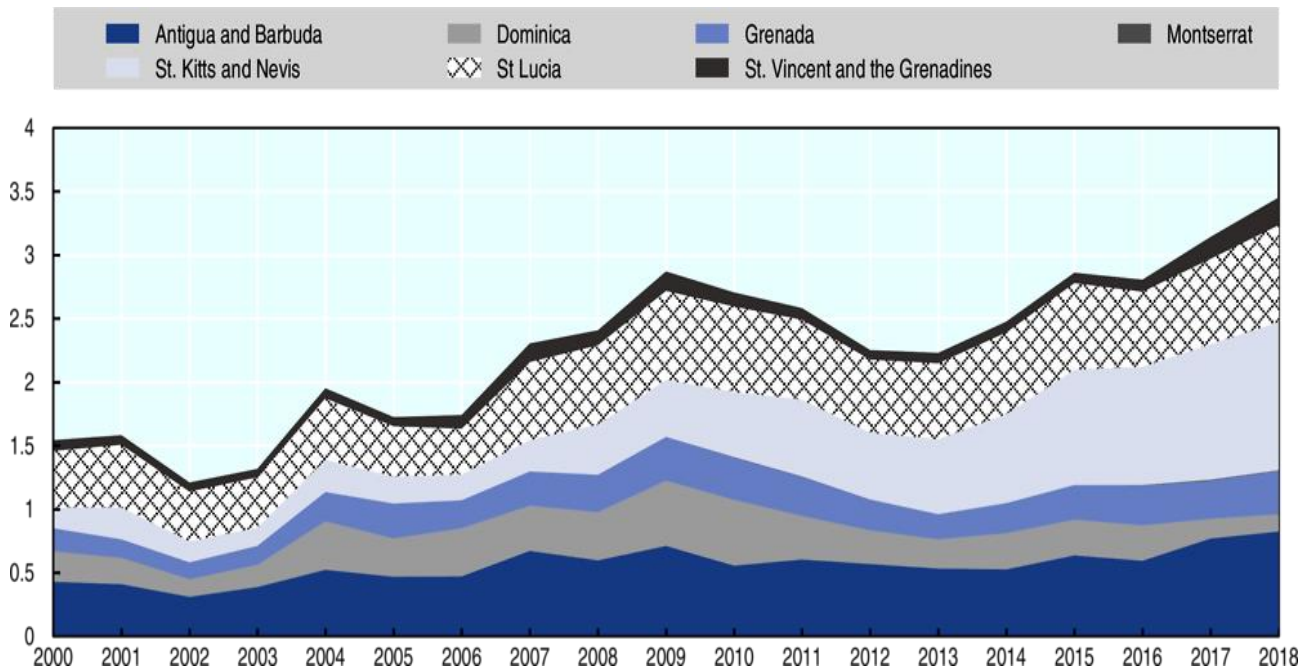


Figure 5-8 Annual cruise passenger visitors to Caribbean island countries, 2000-18 (Eastern Caribbean Central Bank, 2018)

An increasingly acute issue for many developing countries is balancing the promotion of trade activities that serve external demand with the need to address environmental concerns. Global tourism is a case in point, as it has significant negative environmental impacts, putting pressure on domestic freshwater supplies, food systems and waste disposal systems (OECD, 2018).

Another issue is the impact of pandemic COVID-19 on the tourism industry and the uncertainty about how long it may last. It is difficult to predict how the recovery of the industry will unfold, given the extent of the economic damage, the reduced purchasing power of many potential travelers and the likelihood that tourists will be reluctant to travel, particularly to countries without developed health systems. Any medium-term government support should ideally steer the industry towards more sustainable practices, supported by effective political and economic instruments.

European Parliament Data (EU, 2019)

The coastal and maritime tourism sector is by far the biggest employer in the blue economy while it's employing more than 2.2 million people (accounting for 54 % of jobs in the established blue economy sectors).

Coastal and maritime tourism has a great impact in the economic development of coastal regions. In 2017, according to Eurostat, coastal areas accounted for 45.7% of the total nights spent in tourist accommodation. However, the inclination of holidaymakers to visit coastal areas was generally higher in southern EU Member States.

It is well-known that many EU coastal regions are extremely popular tourist destinations. Nevertheless, competition from other non-EU global destinations is rising while travelling has become more affordable with the offer of many low-cost air companies and the digitalization of services. In addition, the level of competition between different tourist destinations is rising as more countries around the globe are stepping up their efforts to become accessible to tourists and the available choice to travelers is growing wider.

Despite the fact that coastal and maritime tourism creates a number of opportunities in the economic field (e.g., increased income for the local population, development of local infrastructure, creation of jobs and new businesses, etc.), the mass tourism in certain EU regions also has negative consequences (pollution, excessive waste and wastewater, noise, real estate speculation). The establishment of excessive numbers of bars, tourist shops, hotels and holiday apartments may also be harmful to the lives of the local inhabitants. The authorities of tourist areas have to accomplish various tasks, such as ensuring waste collection, protecting areas of natural beauty or local heritage and dealing with the many effects of the increasing scale of mass tourism. These challenges must be tackled at a time of economic restraint and limited budgets.

A Parliament study on over-tourism shows that many coastal areas in the EU suffer from the negative consequences of mass tourism and the climate change which is also expected to affect coastal regions considerably and therefore it's weakening their tourism potential.

Another challenge is that various local and regional economies are dependent exclusively on tourism which known as 'tourism monoculture'. Seasonality is very high in the spring and summer months for some of these destinations. The local tourism product must be diversified with parallel activities, such as agriculture or the creation of local products, may help to fight this trend. The promotion of alternative forms of

tourism that helps to create a host of new activities may provide a source of diversification for local and regional economic sectors.

Tourism must also face challenges relating to human management, training, and lack of professional skills. The development of long-term career prospects is not facilitated by short-term contracts, challenging working conditions and seasonality. Also, considering that many tourism jobs are seasonal and low-paid, it is important to invest more in vocational training and skills acquisition actions for locally employed personnel, to upgrade human capital and provide a better match for tourism market requirements.

Coastal and maritime tourism can give opportunities for economic growth. Nevertheless, profit comes at a price. To provide high safety standards, some forms of coastal and maritime tourism require careful maritime spatial planning and control. The cruise sector can earn more profits for certain ports and coastal regions, but unfortunately, cruise companies try to capture as much passenger revenue as they can. So, the environmental footprint of the cruise industry is considerable.

The European Commission released a European strategy, in 2014, for more growth and jobs in coastal and maritime tourism, where it identifies 14 actions that can help the sector grow sustainably and provide added impetus to Europe's coastal regions. Also, there are several policy initiatives and laws in many fields relating to tourism (consumer protection, travel, etc.).

5.5 Oil and gas industry



Figure 5-9 Oil and gas industry, Source: <https://oceanactionagenda.org/story/oil-gas-economy-gulf-mexico/>

The offshore oil and natural gas industry is the sector with the largest share of today's ocean economy and contributes to many developing economies, mostly in Africa and Latin America, despite important environmental externalities (OECD, 2016). There are running projects in Indonesia, Malaysia, Myanmar, Thailand and Vietnam, with around 60% of current production in the Southeast Asia region coming from offshore fields located in shallow waters of less than 450 meters in water depth. 2019 was the third strongest year of the past decade in terms of revenues, when offshore projects generated nearly USD 90 billion of cash flow for publicly traded RND (Research and Development) companies (Bouso, 2020). The COVID-19 pandemic will have strong economic impacts on many developing countries while it brought the industry to a sudden pause in early spring 2020 as demand collapsed at a time when supply was still significantly increasing (IEA, 2020).

Apart from Nigeria and Angola which are Africa's largest oil and gas producers, there is an unprecedented number of other African countries (Ghana, Mauritania, Mozambique, Senegal, Somalia, and South Africa) which are extending new exploration licenses to offshore companies (Beckman, 2019). The oil and gas sector accounts for about 10% of Nigeria's GDP and around 86% of its exports revenue, which represents 70% of total government revenue (OPEC, 2020). Oil production and its

supporting activities contribute around 50% of Angola's GDP and around 89% of exports.

The results of recent oil and gas exploration programmes, particularly from the Atlantic coast, was the momentum for new extraction licenses. There are large deposits off the coasts of Senegal in the MSGBC basin (Mauritania, Senegal, Gambia, Guinea-Bissau and Equatorial Guinea), all since 2015. Several countries in the region have been working to grow and structure their local industry through training, while also strengthening regulatory institutions to deal especially with the many environmental aspects of the developments. With the uncertainty surround oil demand and price recoveries in the short to medium term, it is conceivable that investments in some offshore oil and gas projects will be delayed or cancelled due to low prices stemming from the reduced demand and oversupply.

European Parliament Data (EU, 2019)

The marine extraction of minerals, oil and gas represents around 13 % (€22.8 billion) of the gross value added (GVA) of the established blue economy, although it accounts for only 4 % of the jobs (162.374 people). The extraction of minerals accounts for half of employment, followed by support activities (28 %), offshore oil (13%) and natural gas (9%).

Over the past decade (2009-2019), GVA has fallen by 34.5% while profits have fallen by 47.5%. Among EU Member States, the UK accounts for 52% of GVA and 27% of jobs in marine extraction. The remain percentage belongs to Poland, Germany, Italy, and France. The main reasons for decline are:

- low selling prices
- high production costs
- development of new onshore exploitation techniques

A boost to the sector in the future, could be given by the development of new and more efficient subsea exploitation systems. Also, the recent increases in hydrocarbon (oil and gas) prices might make offshore reserves more economically viable. If the conditions

are suitable, it could be feasible the opening new production wells in the North Sea which point the continued viability of offshore extraction.

A huge environmental challenge but also an important motor of the blue economy, is the decommissioning extraction facilities in the North Sea where the reserves have been depleted. Such a project, the decommissioning of offshore oil and gas platforms, requires an investment of €30 billion over the next 30 years which are usually carried out by large companies and/or groups of investors in the energy and minerals sector. Energy market trends as well as future regulations will help to determine the costs and extent of decommissioning required and thus its relative weight in the blue economy.

5.6 Seabed mining



Figure 5-10 Seabed mining, Source: https://www.miningandenergy.ca/mines/article/demand_for_rare_earth_metals_and_mineralsinc_reasingly_rare_on_landspurs_dee/

The depletion of land-based resources, alongside the rising demand for minerals and metals, is leading to growing commercial interest in exploiting resources on the seabed in national waters and the high seas. There are numerous projects of marine mining in operation in various parts of the world. These are mostly located on continental shelves not far from the shore. Seabed mining is a promising opportunity for many developing

countries, but if such projects are not managed carefully, they can have significant environmental impacts on coastlines and the high seas (Miller, et al., 2018).

Nowadays, ongoing mining projects are targeted for extracting diamonds, phosphates, and seabed marine sulfide deposits, with characteristic examples in Namibia, South Africa, China, Japan, and Korea. Unfortunately, these projects are still in a small scale globally, and the available economic data that are published are still poor. One of the world's first seafloor miners, Nautilus Minerals, declared bankruptcy in 2019, while it was trying to develop a deep-sea gold, copper, and silver project off the coast of the Papua New Guinea. The project lacked from technical issues, financial setbacks, and community opposition.

The ISA (or International Seabed Authority) is currently supporting international negotiations on the drafting of technical and environmental rules as part of a possible International Mining Code for the high seas (International Seabed Authority, 2019), by signing 30 contracts for exploration, not exploitation, with contractors. The contractors are government bodies or companies with sponsoring states, which have the exclusive right to explore for their specified categories of resources for up to 15 years and to take advantage of a 150 000 km² area. Contractors have also the right to apply for more than once for extensions of up to an additional five years. Clarion-Clipperton Fracture Zone (Pacific Ocean), Western Indian Ocean and Mid-Atlantic Ridge, are where the activities are getting place. The contractors are obliged to propose a program for the training of developing country nationals, as a part of each exploration project. By several developing countries mineral extraction is now seen as a promising opportunity. As such an example, the Seychelles and Mauritius have worked regionally to map their seafloor to delimit their continental shelf and extend their sovereignty rights.

When mining moves beyond exclusive economic zones and towards the high seas, then it remains an experimental industry with still-unknown impacts on the marine environment and biodiversity, particularly in areas where information of the ocean floor and deep-water ecosystems is limited. Much science takes place with the current deep-sea exploration phases. Researchers can access wealth of data from the International Seabed Authority (International Seabed Authority, 2019) website, in which scientific atlases of the many newly discovered megafauna, meiofauna and macrofauna species found in the abyss are already available. Even though deep-sea science is progressing,

there is still much uncertainty about any future operational seabed mining in the high seas. It could have a destructive impact on marine ecosystems that may be potentially widespread and long-lasting, with very slow recovery rates. Consequently, a few countries have asked for a precautionary approach and even a moratorium on seabed mining activities.

Despite that the COVID-19 pandemic affected short-term demand for minerals and metals, and some ongoing plans, the commercial exploitation of resources will remain high on the agenda of many developed and developing countries. Policy makers have a challenge to tackle, as countries continue their negotiations on the international regime for using commercially the high seas and the necessary preservation of biodiversity, and the future seabed mining operations.

European Parliament Data (EU, 2019)

Till now, there is no commercial deep-sea mining that has taken place in EU waters. There is only a small number of Member States which have sponsored licenses, issued by the International Seabed Authority (ISA), for exploration on the seafloor in areas beyond national jurisdiction. Among the EU Member States, Belgium, Bulgaria, Czechia, Germany, France, Poland, Slovakia the United Kingdom, have sponsored licenses for manganese nodules. However commercial interest is growing, as minerals and metal resources on land, especially cobalt, platinum, rare earths, and titanium, required not least for the growing high-tech industry, including environmental technologies, are increasingly depleted and mining companies are relying increasingly on deeper and lower-grade deposits. The EU depends heavily on imports of metallic minerals, while the domestic production limited to about 3% of world production. That's why the Commission considers, in its blue growth strategy, deep-sea mining to be one of the five sectors with high potential for growth and jobs.

However, deep-sea mining is very controversial owing to the risks it poses to marine ecosystems.

The European Parliament figures out the importance of applying the precautionary principle in relation to the upcoming deep-sea mining sector and calls on the Commission and EU Member States to support an international a temporary prohibition on commercial deep-sea mining exploitation licenses until such time as the effects of deep-sea mining activities at sea have been studied and researched sufficiently and all possible risks are recognized. Instead of further promoting the sector, the European Parliament asks on the EU to invest in sustainable alternatives, specifically in a transition to sustainable consumption and production towards a more circular economy.

5.7 Shipping and passenger transport

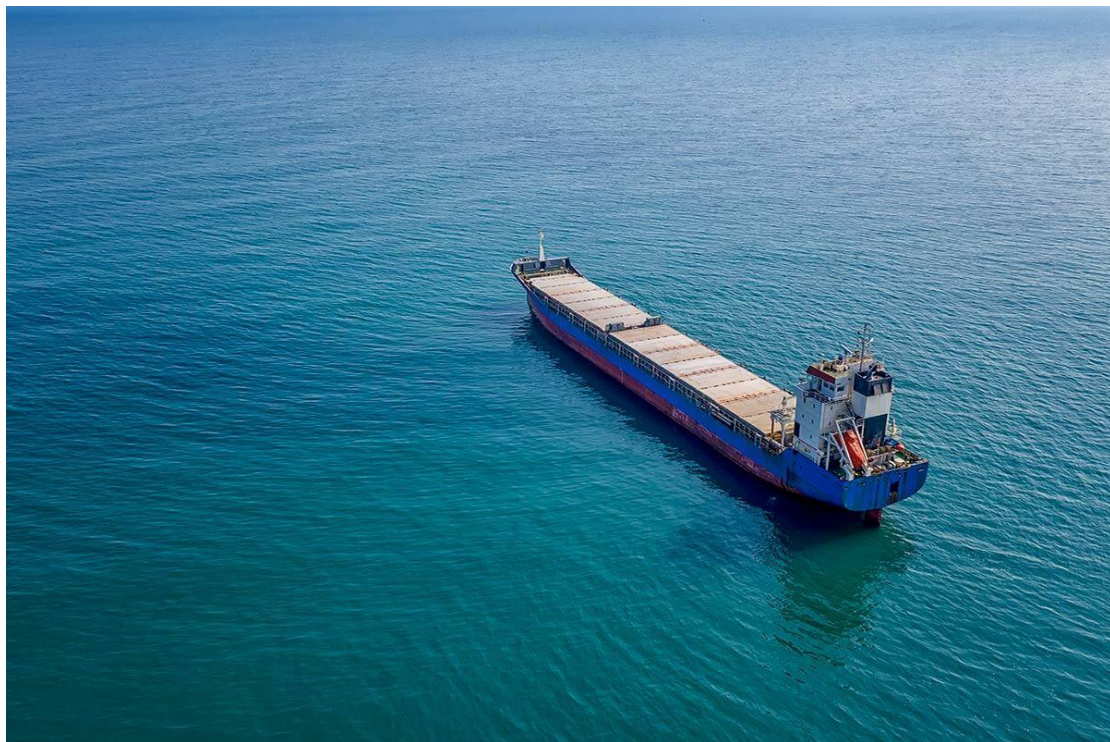


Figure 5-11 Shipping and passenger transport, Source: <https://www.smet.it/en/blog-en/blue-economy-what-it-is-and-why-it-could-revolutionize-the-economy/>

There is a steady growth for both shipping (i.e., maritime freight transport) and passenger transport. International maritime trade has grown almost every year, hitting its peak volume in 2018 with 11 billion tons loaded which all time high (UNCTAD, 2019). The top five ship-owning regions (Greece, Japan, China, Singapore, and Hong Kong) are holding more than 50% of the world's DWT (or dead weight tonnage). There is also a remarkable growth for the main sub-sectors in maritime passenger transport. Globally, ferries transport approximately 2 billion passengers a year, similar with air passenger traffic, and the cruise industry carries 26 million passengers annually (Cruise Market Watch, 2019). Concerning the domestic routes, it consists of a challenge for developing countries, particularly SIDS and archipelagos, to interface different regions via the sea. Indonesia is an example. While its policies aim the development of the domestic freight and passenger transport sectors and the servicing of currently non-economic supply routes, a 2005 regulation obstructs international ships from servicing domestic routes and permits international ships to get in only a limited number of appointed ports. The government also strengthens financially a small number of non-economic goods shipment lines through either a state-owned shipping company or through tenders for any remaining capacity needs.

The maritime transport sector has changed markedly in recent years, and the COVID-19 crisis is having significant impact (ITF, 2020). Trade growth had been decelerating before the pandemic as supply chains patterns became increasingly regionalized, with some possible new incomes for coastal lower middle countries. Simultaneously, technology and services have been playing an expanding role in supply chain management, and sustainability issues have been emerging on the maritime transport industry agenda (ITF, 2019). Additional challenges are likely to come in the surface if the global economic downturn persists.

European Parliament Data (EU, 2019)

The blue economy focuses on coastal and short ocean shipping of each passenger and freight, except deep ocean transport. Shipping of short sea distances represents a third of exchanges in tonne-kilometres inside EU and is crucial for quality of life on islands and in peripheral maritime regions. According to 2018 data, it employed about 232.000 people (6% of jobs in the established blue economy). Inland water transport and the rental and lease of water transport equipment are also included in this sector.

While demand for transportation from world trade is rising, the impact of shipping on the environment and climate must be reduced, so as not to have catastrophic consequences. The IMO and EU have enacted strict legislation on shipping pollution and greenhouse gas emissions. The shipping industry, to conform with the rules, must both deploy the available means of emission reduction and improve ships' energy efficiency by alternative fuels, without compromising safety and efficiency.

In 2017 the Council set the policy priorities for 2020 and beyond, following up on the 2009 EU maritime transport policy: competitiveness, decarbonization and digitalization. The EU is supporting marine transport to reduce road transport emissions and congestion, by financing the development of regular maritime links transporting freight between seaports and infrastructure upgrades on inland waterways and hampering heavy administrative rules.

5.8 Shipbuilding

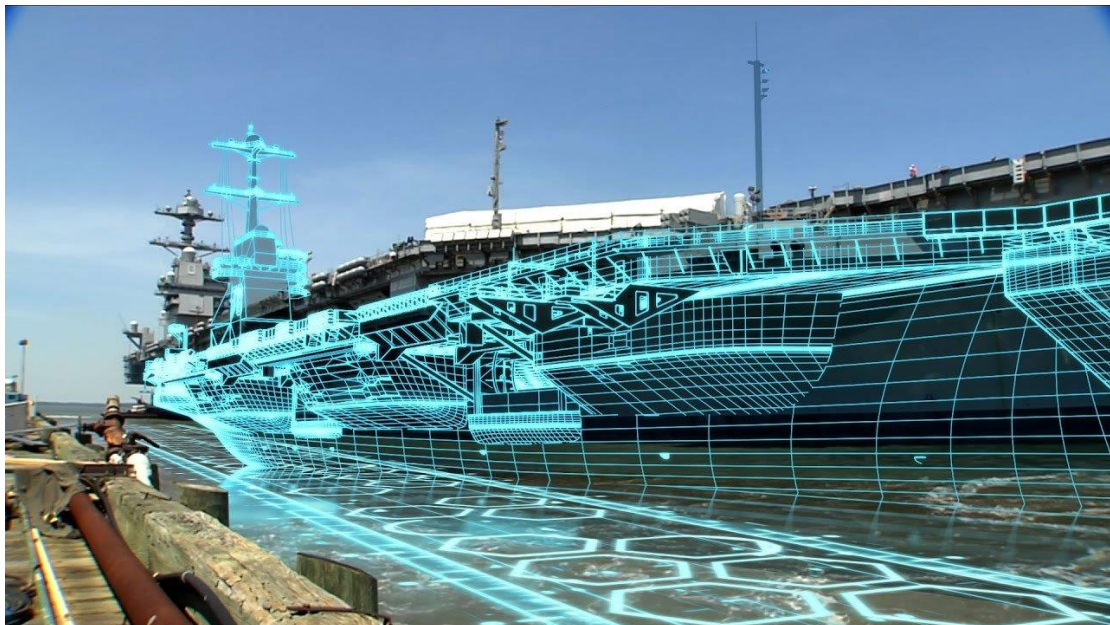


Figure 5-12 Shipbuilding, Source: <https://safety4sea.com/digitalization-can-speed-up-shipbuilding-us-navy-says/>

Shipbuilding is influenced by a multitude of factors ranging from:

- global trade
- energy consumption
- prices of different cargo types
- trade patterns
- vessel age profiles
- scrapping rates
- replacement levels

There has also been a considerable building up overcapacity in the shipping industry because the growth of the global fleet overcome that of world seaborne trade by a considerable margin (Gourdon, 2019).

Asian countries are the dominant shipbuilding market leaders, with China, Japan and Korea together gathering around 90% of global new-build deliveries in tonnage in commercial ships (UNCTAD, 2019). Several European countries (e.g., Denmark, Finland, France, Germany, and Italy) are producing highly specialized vessels such as ferries, offshore vessels, and large cruise ships. European countries also account for about a 50% global market share in the marine equipment industry.

In Indonesia, as in other developing countries, the shipbuilding industry is mainly focused on supplying the domestic market. Even though the period 2012-25 shipbuilding industry development roadmap aims to increase exports of whole ships, the Indonesian industry is limited by poor access to finance, skilled personnel and a tax regime that favors the importation of whole ships rather than maritime parts for construction in domestic shipyards. At the end of the value chain, low-income countries in South Asia (e.g., Bangladesh, India and Pakistan) are involved in scrapping the world's ships (Gourdon, 2019).

The COVID-19 pandemic has caused and is expected to cause many effects on the shipbuilding industry and its broader value chains. The global maritime activities define the ship demand which is affected by the pandemic. On the supply chain, many shipyards experienced production disruptions in 2020 as governments put in place lockdowns measures. Additionally, orders and deliveries of new ships have been

delayed because it has been difficult for ship owners to meet with shipbuilders and conclude deals. The industry needs to adapt recovering measures.

European Parliament Data (EU, 2019)

Traditionally, shipyards within the EU focused to build mainly larger seagoing vessels for the merchant fleet and for military functions and later for the offshore energy business. However, due to labor costs and steel prices, the EU has gradually lost its leading position to Asian competitors. In order to balance this loss, the sector has specialized in building high-value market vessels and technologically specialized ships. Smaller shipyards are specialized in fishing vessels or mega-yachts. The sector also manufactures marine equipment, as well as marine machinery and navigation instruments, and provides products and services for ship maintenance, repair and conversion. The fleet of more than 300 shipyards, makes the EU a world market:

- 6% in terms of tonnage
- 19% in terms of value
- and up to 50% for marine equipment

Ship construction is a long period process, with the delivery date of the vessels to be several years after the order. When the industry was hit by the 2008 economic crisis, ships ordered in the 2000s were still arriving. With the resulting overcapacity, demand for newbuilds decreased, except for liquefied natural gas (LNG) tankers, specialized offshore vessels, and cruise ships. Future demand for newbuilds relies on both economic factors, and the regulatory framework. Stricter regulations for ships' environmental performance (emissions) and energy efficiency (fuels) will require fleet renewal or adaptation.

The sector employs about 315 000 people which is the 8% of jobs in the established blue economy. Employment has reduced since 2009, hitting particularly Germany, Poland, and Spain. Subcontracting is now the new business model. The workforce is getting older, with few young, qualified workers entering, which could put both EU knowhow transmission and naval security at risk.

Through the initiative Leader SHIP 2020, the Commission is seeking to revitalize the sector by supporting employment and skills, financing, better market access and fair market conditions as well as research into clean, safe and energy efficient vessels. Under the Horizon 2020 program, the EU has funded research and development

projects to make shipping more sustainable, among them the construction of the world's largest electric ferry in Denmark and the planned first sea-going ferry powered by hydrogen from renewable sources. The investments in green shipping are supported with the loans Through the European Fund for Strategic Investment (EFSI) and the European Investment Bank (EIB).

5.9 Ports



Figure 5-13 Ports, Source: <https://ocean.economist.com/innovation>

According to 2017 data, the EU has about 1.200 maritime ports which handled 4 billion tons of freight and served 415 million ferry and cruise passengers. Port activities include:

- cargo handling
- warehousing and storage
- construction of water projects
- services relating to water transportation

EU seaports employs more than half a million people which is the 14% of jobs in the established blue economy and has created about 2.5 million jobs.

Seaports differ in terms of:

- size
- function
- geographical characteristics
- ownership and governance structures
- influence of prevailing trade patterns

Most of the ports had to face the challenge to accommodate ever larger ships, requiring adapted port infrastructure and waterways, and services such as fast cargo handling, storage facilities and hinterland connections, or passenger terminals and supply services. Also, the development of conventional and renewable energies has turned ports into energy hubs.

Ports generate employment and economic benefits, when if they become home to maritime clusters, typically bringing together port and logistics, shipping and maritime services, shipbuilding, and repair. But all this increases traffic, rising the congestion and pollution, and sharpens competition for land space. These challenges need to be addressed by common from both the port and the local area.

After 2013 announcement on port development, the EU gave access to several port services and introduced rules for transparent public funding and pricing of port services and infrastructure use. From 2021, new EU rules, waste from ships, including marine litter must be accommodated by the ports. The Commission supports a European social dialogue between port workers and their employers by modernizing and explaining the State aid rules.

For the 329 Trans-European Transport network seaports, the Commission has provided more than € 1 billion in co-financing via the Connecting Europe Facility (CEF). The projects are focused on improving port infrastructure, on hinterland connections and on innovation and greening projects (such as infrastructure to provide LNG as fuel and shore-side electricity for vessels at berth).

5.10 Renewable energy

The process of powering by electricity is a major challenge in many developing countries that are dependent on the import of fossil fuels for energy generation. The cost of fossil fuels charges the government's budgets, business, and households, and disproportionately affects people already struggling with poverty. Especially, in the case of SIDS, more than 30% of foreign exchange reserves are allocated each year to cover the cost of fossil fuel imports and where retail energy rates are from three to seven times higher than in developed economies (OECD, 2018). To reduce the cost of energy and transition towards a greener, low-emission development pathways, several renewable solutions are being tested in favor of recent innovations in offshore wind farms and solar and geothermal resources. Although, these renewable energies are often combined with diesel generators to function effectively in developing countries. The covering from renewables in meeting global energy demand is expected to increase by a fifth over the period of 2018-23, reaching 12.4% (IEA, 2018).

Offshore wind is a rapidly growing sector (IEA, 2019) that has expanded over the last 20 years in both developed and emerging countries, from almost zero to a total global capacity of 18 gigawatts (GW) in 2017. Offshore wind generation's cost has dropped progressively, and projections suggest that offshore wind could reach between 15 to 21 GW per year from 2025 to 2030. (GWEC, 2019) According to commitments made under the Paris Agreement on climate change, this growth is expected not only in OECD countries and China, but also in several developing countries where offshore wind can expand electricity access and increase the share of renewable resources in the energy mix. But the long-term impacts of large offshore wind farms on the ocean environment itself are slowly starting to be considered too. The offshore wind sector presents some opportunities and challenges for low-income countries. Technical difficulties can be huge due to geographic characteristics and remoteness, particularly for SIDS. Offshore wind farms still require large upfront investments.

Marine renewable energy that includes wave, current, and tidal energy, is also considered an important potential source of power generation for the transition to a low-carbon future (IEA, 2019). However, ocean energy technologies are mostly still at a

demonstration stage, with only a few prototypes moving towards the commercialization phase. There are few cases in which the installation of wind turbines on land or as offshore platforms is not possible due to topographical constraints and competition for space with other ocean-based industries, typically coastal tourism. This is happening for many SIDS that are considering these marine renewable energy options.

The exploitation of geothermal resources can be explored for some tropical islands, particularly volcanic islands where the geothermal technologies generate stable and carbon dioxide (CO₂) emissions-free baseload power. The International Energy Agency, in 2018 forecasts for renewable energy to 2023, predicted the growth in geothermal capacity as projects in nearly 30 countries come online. 70% of the growth concerns the developing countries and emerging economies (IEA, 2018). The Asia Pacific region, except for China, has the largest growth (1.9 GW) over the forecast period. Indonesia's expansion is propelled by its abundant geothermal resource availability and a project pipeline in the construction phase supported by government policies. In terms of capacity growth, Kenya, the Philippines, and Turkey follow in terms of capacity growth. It must get solved the concern of environmental impacts (e.g., seismicity, possible ground and water contamination, and air pollution) and economic and governance aspects (Meller, 2018). For instance, in the French Caribbean department of Martinique, the first large geothermal plant, named Nemo (New Energy for Martinique and Overseas), was launched in 2016 and then abandoned due to technical issues and environmental risks linked to the use of ammonia in production.

5.11 Offshore wind



Figure 5-14 Offshore Wind, Source: <https://www.boldbusiness.com/energy/offshore-wind-technology-renewable-energy-conundrum/>

Offshore wind is the most advanced of the emerging and innovative sectors of the blue economy. Employment in the sector continues to grow and was estimated at around 210 000 jobs in 2018 (up from 183 000 in 2017), just over half of the total employment in the broader wind energy sector. Electricity produced from offshore wind serves more than 10 million households in the EU. Most installed capacity is located in the UK (44 %) and Germany (34 %), but offshore wind is also a growing sector in Denmark, Belgium, and the Netherlands. The vast majority of global offshore wind capacity was built in the Atlantic, although the Mediterranean Sea has considerable potential that could be commercially exploited.

European investment in both offshore and onshore wind energy is growing at a rapid pace, with major annual increases in recent years. According to a report from the interest association Wind Europe, in 2018 alone 6.7 gigawatts (GW) of new wind power capacity was financed and €27 billion was invested in new wind farms across Europe. Wind energy accounted for 60 % of total new investments in power capacity in Europe in 2018, far exceeding all other energy sources. The JRC status report on wind energy (2016 edition) finds that offshore wind accounts for only a small share of global wind power capacity (3 %), but that most of the substantial new investments in offshore wind capacity have been in Europe. In fact, new offshore wind capacity investment in the EU in 2015-2016 exceeded onshore wind capacity investment. An external study on investment in the blue economy, suggests that the offshore wind energy industry in

Europe needs to attract €90 to 123 billion in funding by 2020. The study argues that this level of investment is perfectly feasible because offshore wind has become an established investment in a relatively mature industry with well understood risks and returns, where Europe continues to be a global leader.

In the longer term, a 2019 offshore wind outlook report by the International Energy Agency predicts that global offshore wind power will expand impressively over the next two decades. For the EU, it suggests that offshore wind capacity is set to increase at least fourfold by 2030, which would put offshore wind on track to become the EU's largest source of electricity in the 2040s.

5.12 Ocean energy



Figure 5-15 Ocean Energy, Source: <https://greeknewsagenda.gr/topics/business-r-d/6761-blue-economy-2018>

The ocean energy sector (tidal and wave power) is rather small in the EU but holds considerable promise. According to a 2012 United Nations report, tidal and wave power have the greatest potential capacity of all renewable energy sources, but they also tend to have the highest production costs. This makes it difficult to predict their scale of deployment in future, which hinges on the need to reduce capital costs. Currently over 430 companies in the EU accounting for an estimated 2 250 jobs are involved in

different stages of the ocean energy supply chain. There are already concrete examples of power stations in Europe generating electricity from tidal energy.

According to the interest association Ocean Energy Europe, there are commercial plans to invest in around 100GW of installed capacity exploiting ocean energy by 2050, with a view to delivering around 10 % of EU electricity consumption. According to the European Commission's EU blue economy report (2019), such an ambitious goal will require very successful research and development (R&D) on ocean energy technologies. A cumulative €3.5 billion has been invested in ocean energy R&D projects across the EU. While most R&D funding on ocean energy is from private sources, the EU itself allocated around €440 million between 2007 and 2018, with an extra €148 million committed in 2019. Ocean energy is likely to receive even more EU funding under the proposed Horizon Europe framework programme for research and innovation, which will run from 2021 until 2027 with climate change action and low-carbon energy technologies among its priorities.

The European Commission's 2019 EU blue economy report estimates that a pipeline of about 5GW of ocean energy projects can be delivered by 2030, assuming that capital costs for ocean energy decline at a similar rate as they did for offshore wind. However, a market study on the prospects for ocean energy in Europe, produced for the European Commission in 2018, is rather more skeptical and suggests that cumulative global installed capacity of ocean energy is likely to be in the range of 1.3-3.9 GW by 2030. In any case, Europe is expected to remain the global leader in this sector and will still account for the majority of projects. An external study on investment in the blue economy, foresees investments of €2.8-9.4 billion in Europe in the period until 2030. This wide predicted range is because of the highly contrasting scenarios for commercialization of ocean energy technologies.

Tidal and wave power may face somewhat different prospects over the coming years. The JRC status report on ocean energy (2016 edition) finds that whereas tidal energy technologies have reached technological maturity, with the focus now being reliability and cost reductions, the development of the wave energy sector has slowed down over the past few years because viable technologies have been slow to develop, despite the existence of a number of worldwide demonstration projects. While wave energy has considerable long-term potential, it may take many more years for the technology to reach a commercial stage of development.

In its 2018 resolution on international ocean governance the European Parliament highlighted the major potential of ocean energy and noted that, in the long term, it has the potential to become one of the most competitive and cost-effective forms of energy generation.

5.13 Marine biotechnologies



Figure 5-16 Marine biotechnologies, Source: <https://www.tehrantimes.com/news/470231/Marine-biotechnology-nascent-growing-in-Iran>

Till now, the potential of marine bio-resources remains largely unexploited, although many developing countries have plenty of valuable marine resources. As ocean processes become better understood, many countries are aiming to carry forward marine biotechnology for future pharmaceutical drug development and cosmetic products for health and well-being as well as for food production using algae, biofuel, etc. (OECD, 2017). Marine bio-resources research is already necessary in many industries, for example in the pharmaceutical sector for the development of new generations of antibiotics. Marine genetic resources could be utilized at the fight against pandemics.

To date, an increasing number of developing countries, such as Seychelles, have integrated this marine bio-resources dimension in their respective ocean economy

strategies. Nevertheless, the gap between developed and developing countries on bioprospecting is getting bigger. Ten developed countries possess more than 98% of the patents associated with a gene of marine origin. (Blasiak R. et al., 2018) Despite conventions on the protection of biodiversity (e.g., the Convention on Biological Diversity and the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization), several multinational companies are using patents to obtain genetic resources or traditional knowledge. For instance, a single corporation, BASF which is headquartered in Germany and the world's largest chemical manufacturer registered 47% of all patent sequences based on genes of marine origin. The Yeda Research and Development Co. Ltd., the commercial arm of the Weizmann Institute of Science in Israel, registered more than half (56%) of all university patents, more than the combined claims of 77 other universities. At this point, there are no internationally agreed principles concerning the crucial marine genetic resources that are still being discovered. However, negotiations are conducted for access to and benefit sharing of these resources.

But the impacts of the COVID-19 pandemic could also make faster the developments in specific emerging ocean-based sectors, for example for medical applications. Characteristic example is the test which is used to diagnose the novel coronavirus COVID-19 –and in other pandemics such as HIV/AIDS and SARS – was developed by an enzyme which was isolated from a microbe found in marine hydrothermal vents. (Hugus, 2020)

Developing countries should consider exploring and potentially acting in a sustainable way in these activities. An important first action to avoid irreversible damage to fragile ecosystems may be connected with existing knowledge and innovation networks to form partnerships and base any future activities on scientific evidence.

European Parliament Data (EU, 2019)

Although there is no overall employment data available, a study in 2014 for the European Commission estimated employment to be in the range of 11.500 to 40.000 jobs (mostly specialized, highly trained, researchers, innovators and entrepreneurs), while the 2019 blue economy report estimates there are currently some 17.000 jobs in the algae biomass subsector.

Algae production is showing impressive growth globally and tripled between 2000 and 2016. China remains as the main algae supplier, representing 47% of global volume in comparison to EU production which remained more static by representing only 0.2% of global volume in 2016. In EU, France and Ireland are the main producers in terms of weight, although statistics for all Member States are not accurate.

A blue bioeconomy forum launched in 2018 through the EMFF. It was a partnership among industry, public authorities, academia, and finance which has been set up for strengthening Europe's position in the blue bioeconomy. The forum aimed to develop a draft roadmap on the development of the EU blue bioeconomy. Among the issues mentioned are:

- unclear rules and regulations that apply to blue bioeconomy activities,
- lack of reliable statistics and scientific measurements
- a lack of funding
- labor skills.

Also, it got noticed that some activities could generate ecosystem services that could be exploited to achieve environmental targets.

The EU has funded many research projects through its successive research framework programmes. The Horizon 2020 blue bioeconomy COFUND project, for example, is a €30 million R&D funding scheme targeted at identifying new and improving existing ways of bringing bio-based products and services to the market. The initial projects selected are expected to take off in 2020.

In a 2015 resolution on the blue economy, the European Parliament recognizes the huge potential of the blue biotechnology sector for creating new products with high added value and pays attention to the education and training requirements, asking for cooperation between Member States and the private sector.

6. TRANSITION TO A SUSTAINABLE BLUE ECONOMY

6.1 What is the sustainable blue economy

A healthy ocean is a key to a sustainable future both for people and the planet. Harnessing the resources of our oceans and coasts can go a long way in meeting this demand, and it is imperative that we do this in a sustainable manner. Humankind has historically pursued and achieved economic progress by exploiting frontiers, moving to the next frontier once the former is exploited. (Edward B. Barbier, 2011)

A sustainable blue economy plays a central role in alleviating the pressures on land resources and fostering climate change mitigation and adaptation. In this context, the need to develop and promote sustainable blue economy activities has become critical. In order to be “sustainable”, the blue economy needs a model quite different from our dominant economic model: that is an economy that converts public wealth into private profits, leaving in its wake a trail of devastation with distributional inequity, environmental externalities, and depleted resources for future generations. (Sukhdev, 2018)



Figure 6-1 Sustainable Blue Economy, Source: <https://ocean.panda.org/>

A Sustainable Blue Economy is a holistic and innovative approach based on environmental-friendly technologies and techniques such as renewable and clean energy production with low-carbon emissions and less use of energy, land, and water resources. It is a precautionary, transparent, and adaptive approach (World Bank & UNDESA, 2017) (WWF, 2018) and in order to be truly sustainable, it needs to be circular too. As we already discussed, the Blue Economy concept is based on a low footprint and zero waste processes. Every waste output from one activity becomes an input to another one and is transformed into new resources, thus reducing pollution. (WWF, 2015) (BEP, 2016) In addition, it includes policy tools to transform marine activities into environmentally friendly activities. This can be achieved for example through eco-ports, ecotourism, eco-fleet, ensuring thus their long-standing sustainable management. The application of those tools is greatly dependent on the political will of relevant authorities, access to finance, engagement of all stakeholders, as well as the availability and quality of data (e.g. Green taxes, carrying capacity, ecological footprint, and life cycle assessment of each component) (EC, 2020e) (UNDP, 2018)

A sustainable blue economy includes all related marine, ocean-based, coastal, and land-based activities that directly or indirectly link to the blue economy. It includes all sectors, as this allows the currently unsustainable sectors and activities to be captured, which in turn will enable a shift towards more economically, environmentally, and socially sustainable activities that are based on a sustainable governance system that ensures a well-managed and regulated use of ocean resources. (Ecorys, et al., 2021) The blue economy's main sectors include some familiar to all (ocean fisheries, tourism, transportation, marine energy, and seabed mining for minerals) and some unfamiliar sectors ('blue carbon' sequestration by restoring mangroves and seagrasses, amongst the largest carbon stores). Restoring, protecting and maintaining the diversity, productivity and resilience of marine ecosystems will need clean technologies, renewable energy, and circular material flows. But above all, since much of the ocean comprises global or national commons, it will need regulations, international agreements and financing principles that cannot be "cut-and-pasted" from those of our "business-as-usual" model. A significant and coordinated effort is required from member states of the United Nations, including Regional Fisheries Management Organizations, the International Seabed Authority and others with important ocean

jurisdictions, to re-examine their rules and performance in the context of this economy’s necessary new purpose: achieving SDG14. (Sukhdev, 2018)

Blue Economy Sector or Activity	Relevant SDG 14 Target	Rationale
Fisheries	Target 14.1	Improved fisheries management will contribute to a reduction in sea-based pollution from fishing vessels, including in the form of discarded fishing gear, which will help reduce marine debris and ghost fishing
	Target 14.2	Improved fisheries management will build resilience of ocean ecosystems as a whole
	Target 14.4	Achievement of targets 14.7 and 14.4 depend on each other
	Target 14.6	Achievement of targets 14.7 and 14.6 depend on each other
	Target 14.b	Access to markets will allow artisanal fishers to benefit from the blue economy
Aquaculture	Target 14.1	Sustainable aquaculture causes minimal pollution and in the case of seaweed and mollusk culture is a net remover of nutrients from the aquatic environment
	Target 14.2	Sustainable, climate-smart aquaculture can help build resilience by increasing incomes and diversifying livelihoods
Bioprospecting and biotechnology	Target 14.a	Capacity building and technology transfer are required for SIDS and developing countries to participate in marine bioprospecting and biodiscovery activities
	Target 14.c	Benefit sharing from the use of marine genetic resources is tied to the implementation of international law, including the Nagoya Protocol for areas under national jurisdiction; discussions are ongoing on a new international legally binding instrument under UNCLOS on the conservation and sustainable use of marine biodiversity of areas beyond national jurisdiction.
Extractive industries	Target 14.2	Deep-sea mining can undermine the resilience of marine ecosystems and species and should thus be preceded by effective social and environmental impact procedures
	Target 14.a	Capacity building and technology transfer are required for SIDS and developing countries to participate in extractive activities

Renewable (offshore) energy	Target 14.2	Ocean energy helps build self-sufficiency and reduce pollution, thus increasing resilience of SIDS and coastal countries
	Target 14.a	Capacity building and technology transfer are required for SIDS and developing countries to benefit from ocean energy and other renewables
Desalination (fresh water generation)	Target 14.1	Desalination technologies may cause pollution in the form of brine and CO ₂ emissions, which will need to be reduced through appropriate technologies, including renewable sources of energy
	Target 14.2	Desalination, together with water conservation and good water governance, can help build self-sufficiency
	Target 14.a	Desalination plants are expensive; financing, capacity building, and technology transfer are required for SIDS and developing countries to benefit from desalination
Maritime transport, ports and related services, Shipping and shipbuilding	Target 14.1	Improved implementation of shipping regulations will reduce sea-based pollution
	Target 14.2	Improvement in management of ballast water, biofouling, and other transportation-related vectors of invasive species will improve overall resilience of marine and coastal ecosystems
	Target 14.a	Implementation of more-sustainable and low-carbon transportation systems globally will require both capacity building and technology transfer
	Target 14.c	Implementation of international law pertaining to the conservation and sustainable use of oceans and their resources, including, e.g., shipping
Coastal and Maritime tourism	Target 14.1	Sustainable tourism reduces marine pollution both from land-based and ship based sources
	Target 14.2	Sustainable tourism can help build ecosystem and human resilience
	Target 14.5	Sustainable tourism can provide financing for marine protected areas

Ocean monitoring and surveillance	Target 14.2	Ocean monitoring provides better data for sustainable management and protection
	Target 14.3	Monitoring ocean acidification is an important component of gaining better scientific understanding about acidification and its impacts
	Target 14.4	Monitoring and surveillance are important components of sustainable fisheries
	Target 14.5	Monitoring and surveillance are important for marine protected area management
	Target 14.a	Capacity building and technology transfer are required for SIDS and developing countries to benefit from ocean surveillance technologies
	Target 14.c	Ocean monitoring and surveillance will assist in implementing international law, including UNCLOS

Table 6-1 Relevance of Blue Economy Sectors and Activities to SDG 14 Targets. (World Bank & UNDESA, 2017)

6.2 Defining the Sustainable Blue Economy

The European Commission defined a sustainable blue economy to facilitate the establishment of a common understanding at the international level of activities and the practices that contribute to the sustainable development of the blue economy. The EC provides a working definition of a sustainable blue economy according to which: "A sustainable blue economy promotes economic growth, social inclusion, and improved livelihoods while ensuring the environmental sustainability of the natural capital of the oceans and seas. Encompasses all sectoral and cross-sectoral economic activities related to the oceans, seas, and coasts. It comprises emerging sectors and economic value based on natural capital and non-market goods and services through the conservation of marine habitats and ecosystem services." (Ecorys, et al., 2021)

Moreover, the United Nations Environment Programme Finance Initiative (UNEP FI) defines a sustainable blue economy as one that "provides social and economic benefits for current and future generations, restores, protects and maintains diverse, productive and resilient ecosystems, and is based on clean technologies, renewable energy, and circular material flows". It is an economy based on circularity, collaboration, resilience, opportunity, and inter-dependence. Its growth is driven by investments that reduce

carbon emissions and pollution, enhance energy efficiency, harness the power of natural capital and the benefits that these ecosystems provide, and halt the loss of biodiversity. General economic activity in the context of marine and coastal environments, regardless of sustainability considerations, is referred to in this guidance as the blue economy. By this definition, the sustainable blue economy is a goal for the wider blue economy, and therefore excludes non-renewable extractive industries (e.g., offshore oil and gas, and deep-sea mining) as well as unsustainable practices in other sectors. (UNEP FI, 2021)

6.2.1 The Sustainable Blue Economy Finance Principles

The European Commission, the World Wide Fund for Nature, the World Resources Institute, and the European Investment Bank have created a framework called the Sustainable Blue Economy Finance Principles to guide investors. These Principles aimed to guide the crucial role that banks, insurers, and investors can play in blue economies and provide a guiding framework for financing a sustainable blue economy. The 14 principles include transparency, risk awareness, impact, and scientific evidence in the development of the blue economy. Their goal is to support the development of and provide a framework for, a sustainable blue economy. The principles are described (outlined) in the table below. (UNDESA, 2021)

<p style="text-align: center;">1. Protective</p> <p>We will support investments, activities and projects that take all possible measures to restore, protect or maintain the diversity, productivity, resilience, core functions, value and the overall health of marine ecosystems, as well as the livelihoods and communities dependent upon them</p>
<p style="text-align: center;">2. Compliant</p> <p>We will support investments, activities and projects that are compliant with international regional, national legal and other relevant frameworks which underpin sustainable development and ocean health.</p>
<p style="text-align: center;">3. Risk-aware</p> <p>We will endeavor to base our investment decisions on holistic and longterm assessments that account for economic, social and environmental values, quantified risks and systemic impacts and will adapt our decision -making processes and activities to reflect new knowledge of the potential risks, cumulative impacts and opportunities associated with our business activities.</p>
<p style="text-align: center;">4. Systemic</p> <p>We will endeavor to identify the systemic and cumulative impacts of our investments, activities and projects across value chains.</p>
<p style="text-align: center;">5. Inclusive</p> <p>We will support investments, activities and projects that include, support and enhance local livelihoods, and engage effectively with relevant stakeholders, identifying, responding to, and mitigating any issues arising from affected parties.</p>
<p style="text-align: center;">6. Cooperative</p> <p>We will cooperate with other financial institutions and relevant stakeholders to promote and implement these principles through sharing of knowledge about the ocean, best practices for a sustainable Blue Economy, lessons learned, perspectives and ideas.</p>
<p style="text-align: center;">7. Transparent</p> <p>We will make information available on our investments and their social, environmental and economic impacts (positive and negative), with due respect to confidentiality. We will endeavor to report on progress in terms of implementation of these Principles.</p>
<p style="text-align: center;">8. Purposeful</p> <p>We will endeavour to direct investment to projects and activities that contribute directly to the achievement of Goal 14 (“Conserve and sustainably use the oceans, seas and marine resources for sustainable development”) and other Sustainable Development Goals especially those which contribute to good governance of the ocean.</p>
<p style="text-align: center;">9. Impactful</p> <p>We will support investments, projects and activities that go beyond the avoidance of harm to provide social, environmental and economic benefits from our ocean for both current and future generations.</p>
<p style="text-align: center;">10. Precautionary</p> <p>We will support investments, activities and projects in our ocean that have assessed the environmental and social risks and impacts of their activities based on sound scientific evidence. The precautionary principle will prevail, especially when scientific data is not available.</p>
<p style="text-align: center;">11. Diversified</p> <p>Recognizing the importance of small to medium enterprises in the Blue Economy , we will endeavor to diversify our investment instruments to reach a wider range of sustainable development projects, for example in traditional and non -traditional maritime sectors, and in small and large-scale projects.</p>
<p style="text-align: center;">12. Solution-driven</p> <p>We will endeavor to direct investments to innovative commercial solutions to maritime issues (both land- and ocean-based), that have a positive impact on marine ecosystems</p>

Table 6-2 Sustainable Blue Economy Finance Principles. (UNDESA, 2021)

6.3 PRINCIPLES OF SUSTAINABLE BLUE ECONOMY

Humanity is increasingly understanding that we are an integral part of the marine ecosystem. We need to plan and implement our economic activities carefully, balancing the desire to improve people's living standards and well-being with the urgent need to maintain the ecosystem's health. Active leadership, both in the public and private sectors, is needed, in order to drive the blue economy in a sustainable orientation. This includes implementing the commitments already made at global, regional, national, and local levels.

WWF has developed a set of "Principles of a Sustainable Blue Economy" (table 6.3) in order to understand what characterizes a sustainable Blue Economy and to ensure that ocean economic development contributes to real prosperity, today and in the future.

These Principles offer:

- A clear definition of a sustainable Blue Economy,
- Guidance on governance because they describe how a sustainable Blue Economy should be directed and managed, by public and private sector actors, at every scale, and
- A set of necessary actions describing what needs to be done, by all stakeholders, if a sustainable Blue Economy is to be realized.

A Sustainable Blue Economy	
Principle	Description
Provides social and economic benefits for present and future generations.	The blue economy contributes to food security, poverty reduction, as well as incomes and livelihoods, employment, health, equality, and political stability.
It preserves marine ecosystems.	The blue economy restores, protects and maintains the diversity, resilience, core functions and natural capital of marine ecosystems on which their well-being depends.
Promotes clean technologies and renewable energy.	The blue economy is based on clean technologies, renewable energy and cyclical material flows to ensure economic and social stability over time, while preserving the limits of one planet.

<p>A Sustainable Blue Economy is governed by public and private procedures which are:</p>
<p style="text-align: center;">Inclusive</p> <p>The blue economy focuses on the active and effective involvement and participation of stakeholders.</p>
<p style="text-align: center;">Informed</p> <p>The blue economy is guided by science -based information to prevent harmful impacts that undermine long -term sustainability. When information is not available, stakeholders take a proactive approach. When new knowledge about risks and sustainable opportunities is gained, actors adapt their decisions and activities.</p>
<p style="text-align: center;">Accountable and transparent.</p> <p>In the blue economy, stakeholders take the responsibility for the impacts of their activities, taking appropriate measures and being transparent so that stakeholders are wellinformed and can exercise their influence.</p>
<p style="text-align: center;">Holistic, cross-sectoral, and long term.</p> <p>In the blue economy, decisions take into account the economic, social and environmental costs and benefits to society, as well as their impact on other activities now and in the future.</p>
<p style="text-align: center;">Innovative and proactive.</p> <p>The blue economy is based on innovative ways to meet the needs of current and future generations, while preserving nature's potential to support human economic activities and prosperity.</p>

To create a Sustainable Blue Economy, public and private actors should:
<p style="text-align: center;">Set clear, measurable, and internally consistent goals and objectives for a Sustainable Blue Economy.</p> <p>Governments, economic sectors, individual businesses, and other actors should set relevant and measurable goals and targets for a sustainable blue economy to provide clear direction to their planning, management and activities.</p>
<p style="text-align: center;">Evaluate and communicate their performance against these goals and targets.</p> <p>The goals and targets for a Sustainable Blue Economy should be regularly monitored and progress communicated to all stakeholders, including the public, in a transparent and accessible way.</p>
<p style="text-align: center;">Create a level economic and legislative playing field that provides the Blue Economy with sufficient incentives and rules.</p> <p>Economic instruments such as taxes, subsidies and fees should aim to internalize environmental and social benefits, costs and risks to society. International and national laws and agreements, should be formulated, implemented, enforced and continuously improved in ways that support a sustainable blue economy.</p>
<p style="text-align: center;">Plan, manage, and effectively govern the use of marine space and resources, applying inclusive methods and the ecosystem approach.</p> <p>All relevant uses of marine space and marine resources should be planned, managed and governed through proactive, preventive, adaptive and integrated processes that ensure the long-term health and sustainable use of the sea, while also taking into account human activities on land.</p>
<p style="text-align: center;">Develop and apply standards, guidelines, and best practices that support a Sustainable Blue Economy.</p> <p>All actors should develop or implement global standards, guidelines, best practices, or other sustainability behaviors that are relevant to them.</p>
<p style="text-align: center;">Recognize that the maritime and land-based economies are interlinked and that many of the threats to marine environments come from land-based sources.</p> <p>To achieve a sustainable blue economy in the seas and coastal areas, land-based impacts on marine ecosystems must be addressed and stakeholders must also work to promote the development of a sustainable green economy on land</p>
<p style="text-align: center;">Actively collaborate, sharing information, knowledge, best practices, lessons learned, perspectives, and ideas, to realize a sustainable and prosperous future for all</p>

Table 5-3 The Principles of Sustainable Development, (WWF, 2018)

7. CHALLENGES TO THE BLUE ECONOMY

Traditionally, the ocean and its ecosystems have been seen as cost-free spaces and a source of unlimited resources, resulting in overuse and, in some cases, irreversible change to marine resources and coastal areas. (Brears, 2021)

The potential for the development of a blue economy is limited by a number of challenges. The first and foremost is the need to overcome current economic trends that are rapidly degrading ocean resources through unsustainable extraction of marine resources, physical alterations and destruction of marine and coastal habitats and landscapes, climate change and marine pollution.

The second set of challenges is the need to invest in the human capital required to harness the employment and growth benefits of investing in innovative sectors of the blue economy.

The third set of challenges concerns strengthening the concept and overcoming inadequate valuation of marine resources and the ecosystem services provided by the oceans, inadequate human, institutional and technical capacity, underdeveloped and often inadequate planning tools, and lack of full implementation of the 1982 UN Convention on the Law of the Sea (UNCLOS) and related conventions and instruments. (World Bank & UNDESA, 2017)

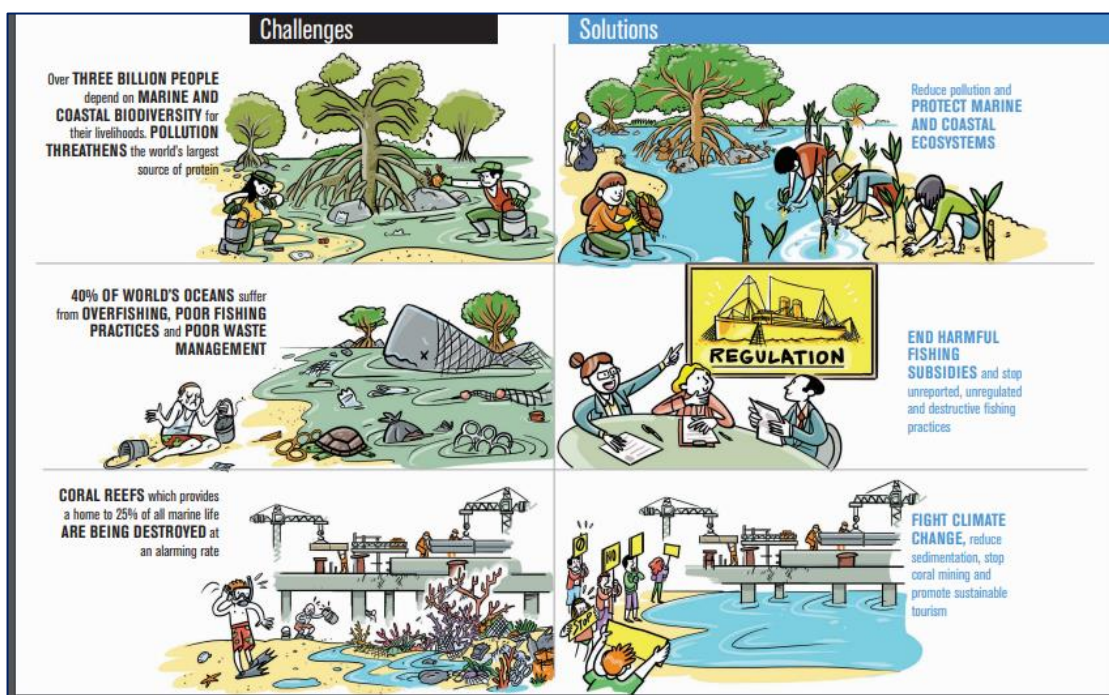


Figure 7-1 Challenges & Solutions of Blue Economy. (UNDESA, 2021)

The following are some of the most serious challenges affecting the realization of the goals of the Blue Economy:

7.1 Climate Change

Impacts of climate change, for example in the form of both slow events, such as sea-level rise, and more intense and frequent weather events. The long-term impacts of climate change on ocean systems are not yet fully understood, but changes in sea temperature, acidity, and major ocean currents, among other things, are already threatening marine life, habitats, and the communities that depend on them. (World Bank & UNDESA, 2017) Global greenhouse gas emissions have increased about 1.5% per year over the last decade. By 2100, this trend will lead to a temperature increase of almost four degrees Celsius, resulting in several impacts on the world's oceans, including the following.

7.1.1 Rising Temperatures

In recent decades, the oceans have warmed at an average rate of more than 0.1 °C per decade in the upper 75 m and 0.015 °C per decade in the lower 700 m depth. Temperature determines the geographical distribution of many species and their response to climate change. If global average ocean temperatures increase by two degrees Celsius in the tropics, fish catches are expected to decrease by 40-60%, potentially endangering food security as many people in the tropics rely on fish for protein. Meanwhile, warmer coastal waters will potentially affect aquaculture, such as with reduced production, resulting in possible relocation. (Brears, 2021)

Increasing ocean temperatures also lead to deoxygenation, i.e. a reduction in the amount of oxygen dissolved in the ocean. In the last 50 years, the open ocean has lost about 2% of its oxygen, the oxygen-deficient zones in the open ocean have expanded to an area equal to the size of the European Union, and the volume of water completely devoid of oxygen has more than quadrupled. (Denise Breitburg et al., 2018) The impact of oxygen depletion on the ocean includes reduced biodiversity, shifts in species distributions, shifting or declining fisheries resources, and expanding algal blooms.

7.1.2 Decreasing Carbon Sink

The oceans act as carbon sinks, absorbing and saving carbon dioxide as part of the carbon cycle. The ocean absorbs carbon dioxide in two stages. Firstly, the carbon dioxide breaks down in surface water. Then, the ocean currents and mixing processes transport the dissolved carbon dioxide from the surface deep into the interior of the ocean, where it accumulates over time. During the period from 1994 to 2007, the ocean absorbed from the atmosphere about 34 gigatons of human-derived carbon dioxide, which is equivalent to 31% of all anthropogenic carbon dioxide emitted during this period.

However, the amount of carbon that has been removed and stored in the deep ocean has decreased by 1.5% as temperatures have risen globally. Each year, 50 billion tons of new plankton bloom at the ocean surface, while six billion tons of dead plankton sink to deeper waters. Therefore, this 1.5% reduction means that about 100 million tons of extra plankton remain at the surface each year, allowing carbon to return quickly to the atmosphere. (Cael, et al., 2017)

Phytoplankton take up carbon dioxide from the ocean as they photosynthesize. This process converts carbon dioxide into organic carbon. Some of these phytoplankton sinks into the deeper layers of the ocean or are consumed by other organisms, which sink themselves when they die. However, in warmer waters, phytoplankton and organisms are more likely to dissolve in the upper layers of the ocean before they can sink, and as they dissolve, the carbon dissolves with them. Because this carbon remains at the ocean surface, it is more easily released back into the atmosphere. (Brears, 2021) Also, the carbon dioxide dissolved in the ocean acidifies the water. (Nicolas Gruber et al., 2019)

7.1.3 Ocean Acidification

As the oceans absorb more carbon dioxide, chemical reactions reduce the pH of seawater, the concentration of carbonate ions and the saturation state of biologically important calcium carbonate minerals. These chemical reactions are called ocean acidification. Calcium carbonate minerals are the building blocks for the skeletons and shells of many marine organisms. Continued ocean acidification has resulted in many parts of the ocean becoming undersaturated with these minerals, affecting the ability of some organisms to produce and maintain their shells.

7.1.4 Impacts of Climate Change on Corals and Marine Fishes

Coral reefs are host the highest biodiversity of any ecosystem in the world. Despite covering only less than 0.1% of the ocean floor, coral reefs are home to over a quarter of all marine fish species. (IUCN, 2017) Coral reefs are disappearing with climate change, with many reefs worldwide having lost over 50% of their coral cover in the last 30-40 years, and some having lost over 90%. Increasing ocean acidification is significantly reducing the ability of reef-building corals to produce their skeletons. Acidification limits coral growth by eroding pre-existing coral skeletons while slowing the growth of new ones.

Marine fishes are also impacted by ocean acidification. Because the surrounding water has a lower pH, a fish's cell often comes into balance with the seawater by taking in carbonic acid. This changes the pH of the fish's blood, a condition called acidosis. This reduces the amount of energy available to digest food, escape predators, and reproduce and it can even slow fish growth. (Brears, 2021)

7.1.5 Sea-Level Rise and Risks to Coastal Zones

Climate change is likely to result in the following:

- An increase in the frequency, duration, and extent of coastal flooding
- Coastal defenses are more often toppled by waves or tides
- Increase in storm severity and increase in storm surge levels
- Ports affected by more frequent coastal flooding, heavy rainfall, and intense wave action
- Erosion of beaches
- Possible saltwater intrusion into coastal aquifers (C. Izaguirre et al., 2021)

7.2 Unsustainable Fishing

In 2018, global fish production was estimated at 179 million tons, of which 82 million tons came from aquaculture production. Of the total amount, 156 million tons were used for human consumption and the remaining amount was used for non-food uses such as fish meal and fish oil. Between 1961 and 2017, world consumption of fish for

food has increased at an annual rate of 3.1%, which is almost double the annual population growth rate (1.6%) over the same period, and higher than that of all other animal protein foods (meat, dairy, milk, etc.), which increased by 2.1% per year.

Overfishing, i.e., the removal of a fish species from a water body at a rate at which the species cannot be replenished, negatively affects biodiversity and ecosystem function and reduces fish production. It leads to negative social and economic consequences, including reduced food security and economic losses to coastal communities. (FAO, 2020a)

Moreover, illegal, unreported, and unregulated (IUU) fishing threatens the sustainability of fisheries. IUU fishing, which includes a wide range of activities, is estimated to affect one in every five fish caught. Globally, the gross revenue associated with IUU fishing is approximately \$17 billion, while the estimated loss in annual economic impact due to the diversion of these fish from the legal commercial system is estimated to be up to \$50 billion, and the loss in tax revenue to countries is approximately \$4 billion per year. In addition, IUU fishing negatively affects livelihoods, fish stocks and the environment. (Brears, 2021)

7.3 Marine Pollution

Land-based sources, including nutrients from excessive fertilizer and livestock waste, sewage and industrial emissions carried to coastal waters, account for around 80% of the world's marine pollution. In addition, land-based pollution of coastal waters is the main source of marine plastic pollution. (Akeem Babatunde Dauda et al., 2019)

7.3.1 Nutrients and Eutrophication

Nutrients from agricultural production, sewage and industrial emissions can accelerate eutrophication in coastal waters. One of the main effects of eutrophication is that it creates dense algal blooms. These blooms limit light penetration, reduce growth and cause mortality in coastal zones, and also harm the success of predators in catching

their prey. High rates of photosynthesis associated with eutrophication can deplete dissolved inorganic carbon and raise pH levels to extreme levels during the day. When these dense algal blooms die, they create a hypoxic or anoxic "dead zone" that does not have enough oxygen to support most organisms. Once the oxygen concentration drops to a critical level, mobile species will leave the area, while stable organisms are forced to initiate survival behaviors or die from declining dissolved oxygen levels. (Brears, 2021)

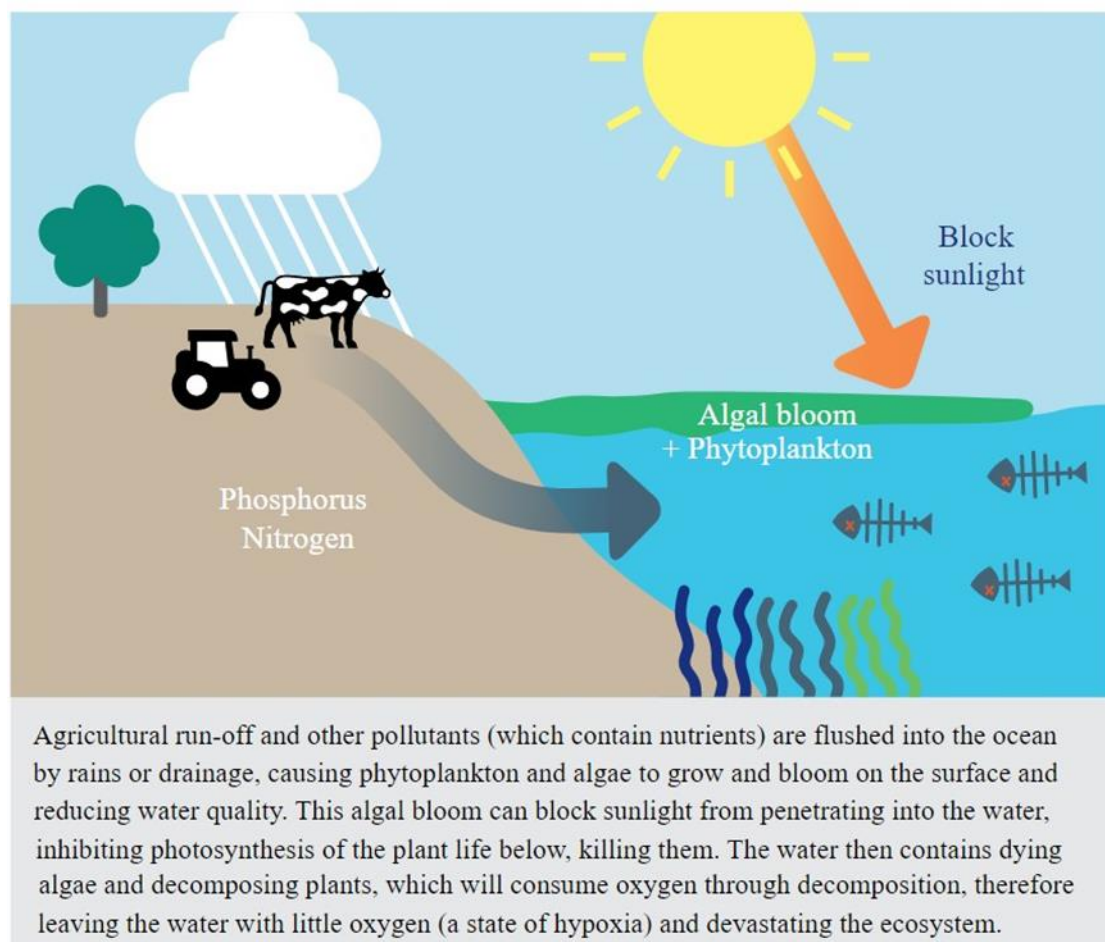


Figure 7-2 Eutrophication and resulting impacts. (UN, 2021)

7.3.2 Marine Plastic Pollution

Over 300 million tons of plastic are produced every year for various uses. Coastal land-based pollution is the main source of plastic pollution in the seas, contributing 9 million tons per year. Rivers are an important source of plastic pollution, transporting plastic

waste from the inland depths to the sea, of which about 94% accumulates on the seabed, 5% ends up on beaches and 1% on the ocean surface.

The effects of marine plastic pollution on marine ecosystems include intestinal tract blockage, entrapment, inflammation, oxidative stress, hormonal disruption, reproductive and metabolic effects and behavioral change.

Chemicals leaching from plastics usually tend to bioaccumulate in the organisms that ingest them and concentrations of chemicals are usually higher at higher trophic levels. Human biomonitoring has found that the compounds used to produce plastics are already present in human blood and cells: In humans, chemicals in plastics have been associated with diseases and pathologies, including endocrine disruption, cancer, developmental disorders and reproductive abnormalities. (Brears, 2021)

7.4 Biodiversity Loss and Degradation Of Marine And Coastal Ecosystems

The world's oceans contain between 500,000 and 10 million marine species, and up to 2,000 new species are described every year. The World Wildlife Fund's (WWF) report "Living Planet 2020" shows an average 68% decline in population sizes of mammals, birds, fish, amphibians, and reptiles since 1970. By 2100, more than half of the world's marine species will be threatened with extinction. (UNESCO, 2020)

Currently, 60% of the world's major marine ecosystems are degraded or unsustainable due to ocean warming, acidification and other anthropogenic activities.

Coastal ecosystems are at risk, with around 40% of the world's population living within 100 km of the coast, creating unsustainable pressure on resources. For example, coastal systems such as mangroves, salt marshes and seagrass beds can sequester carbon at rates up to 50 times greater than the same area of tropical forest. With the human population projected to grow to more than 9 billion by 2050, coastal areas will come under further pressure. (UN, 2017)

Overall, biodiversity loss and degradation of marine and coastal ecosystems impair the ocean's capacity to provide a range of ecosystem services, including the coral reefs, seagrass and mangroves.

7.5 Unfair Trade

Exclusive Economic Zones (EEZs), zones in which a state has dominant rights to explore and use marine resources, are vital to the economies of small island developing states and often dwarf their respective land mass and the administrative capacity of their government. In the case of fisheries agreements that allow access to an EEZ, there is usually low appropriation of fisheries exports by national stakeholders and insufficient transfer to national stakeholders of specific fisheries knowledge by foreign fishing companies, so that the potential for national exploitation of these resources is reduced in the long term. (World Bank & UNDESA, 2017)

7.6 Covid 19

The COVID-19 pandemic has affected the fish and seafood value chains products, through reduced consumer demand (restaurants and hotels), closure of retail outlets, disruption of trade routes, changes in consumer demands and a possible increase in sanitary measures for fish and seafood.

The pandemic is blocking demand, fishing capacity and production at the same time. Other marine sectors affected by the pandemic include the travel and tourism sector, with potential GDP losses in this sector estimated at \$2.1 trillion in 2020 alone. Nevertheless, COVID-19 may, in theory, have a positive impact on the sustainability of global fisheries and the restoration of the natural environment. Therefore, there is a unique opportunity to shift resources towards actions that encourage ecosystem management and support sustainable and alternative livelihoods through the economic activities of small-scale fishers and coastal populations.

7.7 Mechanisms for The Implementation of The Blue Economy

As nations take different approaches to implement their own blue economies, science and technology play a central role in innovating these sectors, as well as in providing the tools to ensure that the other pillars of the blue economy are met. By other pillars we mean improved human well-being and social equity, reducing environmental risks and ecological scarcities. (Steven, et al., 2019) Hence, it is imperative to examine the critical factors and mechanisms for the effective implementation of the Blue Economy. As the goal of the Blue Economy in relation to sustainable development must be clear, the strategies for its effective and successful implementation must be equally feasible and sustainable.

Addressing the challenges of the Blue Economy must be collaborative, transformative, holistic, and sustainable. According to (OECD, 2016), the strategic frameworks recently considered for managing ocean resources within Exclusive Economic Zones (EEZ) are consideration of the Ecosystem Approach and explicit spatial management techniques. For these purposes, instruments such as Integrated Coastal Zone Management, Marine or Maritime Spatial Planning (MSP), and Marine Protected Areas (MPA) are essential. While some states have made considerable progress in designing and implementing these strategic frameworks, some are still struggling to make sufficient commitments. However, there is a growing belief that the Ecosystem Approach is the way forward in the management of ocean resources. (Patil, et al., 2016)

7.7.1 Integrated Coastal Zone Management (ICZM)

ICZM was first introduced at Rio de Janeiro Conference in 1992 'Earth Summit' via Agenda 21 (Tonazzini, et al., 2019) and its objective was to address the challenges in coastal zones. After Barcelona Convention in 2008, was estimated the fragility of ecosystems and started acting as a joined device that links the terrestrial and marine areas. (Papageorgiou M., 2016) Moreover, ICZM is the provider for implementing the MSP concept.

The essence of Integrated Coastal Zone Management is to have a holistic approach to the management of the coastal resources and ensure their sustainability. It defines the broad management interface that extends from the coastal hinterland areas to the coastal waters and the high seas.

According to (FAO, 2010), ICZM provides the framework and policy directives for resource management strategies that avoid conflicting uses of the ecosystem and mitigates negative impacts of human activities on the environment generally. It further provides a framework for synergizing the efforts of various institutions and agencies with mutual objectives and interests in relation to marine and coastal management through unique institutional and legal frameworks. To this end, the ICZM seeks to provide long-term sustainable use of coastal resources amid competing activities for the environmental integrity and benefits of the coastal communities.

7.7.2 Marine Spatial Planning

Marine space is an area where natural and human activities co-exist. The more users, actors, stakeholders, and activities take place in marine space, the more competition and conflicts among them and the marine environment will arise. Thus, it is required a very careful balance between different interests against one another and against environmental concerns in order to ensure equilibrium. (Ehlers P., 2015)

There is a growing international belief that coastal states can significantly increase their potential to manage their ocean resources and plan their activities through marine spatial planning (MSP) in maritime zones (in their internal and territorial seas, as well as on their continental shelves and exclusive economic zones). (Schaefer N. and Barale, 2011)

The UNESCO defines MSP as “a public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that usually have been specified through a political process” (Ehler C. & Douvere F., 2009)

MSP is a process that guides when, where and how human activities take place. It considers a region as a whole and integrates policies and objectives across different sectors, addressing the multiple and potentially conflicting uses of the sea. (Blæsbjerg, et al., 2009) Typically, the MSP process results in the development of a comprehensive plan or policy document often referred to as a master plan, which describes the vision

for the future spatial development of a particular marine area. The plan is long-term and is developed based on interaction with all stakeholders and the spatial data collected for a particular marine area. The policy or master plan is usually implemented through detailed ocean boundary maps, which divide areas into different zones where certain activities are allowed, restricted, or prohibited. (Michaela Young, 2015) (Brears, 2021) The steps for implementing MSP are listed in the Table below.

Step	Description	Activities
1. Planning	This involves talking with managers to determine priorities	<ul style="list-style-type: none"> • Define goals and objectives
2. Data evaluation	This involves assessing the data and identifying data gaps	<ul style="list-style-type: none"> • Define the study area • Data acquisition • Data gap identification • Data content and quality
3. Ecosystem characterisation	This involves describing the ecosystem patterns and processes, including human activities across the area of interest	<ul style="list-style-type: none"> • Socio-economic analysis • Oceanographic analysis • Biological analysis • Habitat analysis
4. Management applications	This involves working with managers to support specific management applications	<ul style="list-style-type: none"> • Planning for MRE • Managing marine resources • Minimising conflicts • Designing Marine Protected Areas (MPA)

Figure 7-3 Steps for Marine Spatial Planning. (Brears, 2021)

According to the OECD, around 50 countries in the world currently have some form of spatial planning amongst which eight countries have statutory plans covering 8% of the global EEZs. It is anticipated that by 2025, more plans would be initiated and approved by about 25 countries covering a further 25% of the EEZ areas. (OECD, 2016)

European countries have already started to use MSP to achieve sustainable use for their marine and coastal areas, by considering biodiversity conservation. For example, Belgium and Germany have developed their plan based on their territorial spatial planning law. The United Kingdom and Scotland have prepared policy framework documents to implement a national MSP and drive future marine sustainable

development. Last, France has applied MSP principles in small zones along the coast, mostly in heavily used areas, to address the competition between its marine activities.

7.7.3 Marine Protected Areas

A marine protected area (MPA) is an area that is afforded greater protection than the surrounding waters for biodiversity conservation or fisheries management purposes. According to the International Union for Conservation of Nature (IUCN), Protected Area is “A clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values”. (Korting J., 2015) The IUCN recognizes six different categories of MPAs, classified according to their objectives, ranging from fully protected areas (no-take zones where no extraction is permitted) to multiple-use areas (where a range of resource uses are allowed). (Brears, 2021)

The system of protected areas for ecosystem conservation currently covers 3.4% of the world's ocean area and 15.4% of the world's land area. These areas are important for supporting people's livelihoods, storing 15% of the world's carbon stock and reducing habitat and species loss due to deforestation. While there has been significant progress in the number and proportion of protected areas globally in recent decades, the extent to which biodiversity and critical habitats are effectively protected and conserved remains a challenge and a growing concern. (UNEP-WCMC, 2018)

8. CONCLUSIONS - SUGGESTIONS

If the global blue economy, were compared to a national economy, it would be the 7th largest in the world, and the ocean as an economic entity would be a member of the G7. Oceans operate in the planet's vastest ecosystem and hold 97% of all our water and 80% of all life forms. They surround and sustain us, providing us with oxygen, food for almost half of humanity, critical resources for human health, and a web of economic interactions.

As a key source of food, energy, minerals, and a means for leisure activities and transportation – upon which hundreds of millions of people depend – the blue economy has the potential to outperform the global economy in terms of both value-added and employment growth as it provides millions of jobs, many in regions where there are few alternatives. It encompasses all industries and sectors related to oceans, seas and coasts, whether they are based in the marine environment (e.g. shipping, fisheries, energy generation) or on land (e.g. ports, shipyards, land-based aquaculture and algae production, coastal tourism). It is a broad, fast-moving segment of our economy, which over the past decade has taken significant steps to modernize and diversify. Alongside traditional sectors, innovative sectors are evolving and growing, such as ocean renewable energy, marine biotechnology, and desalination, thus providing new prospects and creating new jobs.

However, If not well managed and supported, the sector may generate serious damage to global ecosystems and communities. These and other economic activities have a cumulative impact on the marine environment, from visible pollution such as plastic litter and oil spills to invisible pollution such as microplastics, underwater noise, chemicals and nutrients. The effects of climate change and greenhouse gas emissions are devastating on our ocean, coasts and people living in those areas, ranging from changes in water temperature to acidification, rising sea levels, and more frequent and intense flooding and erosion. Coupled with the major threat posed by biodiversity loss, which is driven by climate change, pollution, over-exploitation of resources and the destruction of natural habitats, these impacts will challenge the resilience of the blue economy and society as a whole.

The blue economy is also essential in reaching the Sustainable Development Goals (SDGs) adopted as part of the Agenda 2030 – in particular SDG 14 “Conserve and

sustainably use the oceans, seas, and marine resources”. The 2030 Agenda for sustainable development acknowledges, that without a healthy ocean, life on this planet is at risk and without the ocean’s resources, human societies around the planet lose the ability to sustain themselves.

The contribution of a healthy ocean is essential for a sustainable economy. A sustainable blue economy needs to provide social, economic and environmental benefits for current and future generations e.g. food security, poverty eradication, livelihoods employment, healthy equity, and political stability. In addition to its potential to drive significant economic and socio-economic development, a sustainable blue economy plays a central role in alleviating the pressures on land resources and fostering climate change mitigation and adaptation. A sustainable blue economy will create tangible opportunities for new jobs and businesses. They will be created by work to mitigate the impacts on oceans and coasts to build a resilient economic model based on innovation, a circular economy and a respectful attitude to the ocean. This means that businesses that use or generate renewable resources, preserve marine ecosystems, reduce pollution and increase resilience to climate change will be incentivized, while others will need to reduce their environmental footprint. This is as important for people as it is for the planet.

Guidance is missing right now on what a sustainable Blue Economy looks like. There is a weak formulation on what needs to be done to ensure that Blue Economy is truly sustainable, worldwide. It is important to make sure that marine economic development leads to a sustainable and competitive blue economy. General steps that need to follow all marine spaces are: set the right objectives, tackle mistakes, compliance with regulations, reduce the impacts of marine-based and land-based activities, and utilize technological tools. A great challenge is concerned on how to translate principles into practice. The transition requires awareness of the value of the marine environment and upgrading technologies in a smart direction to fulfill the needs of marine activities by including environmental protection and scientific research. In addition, it is important to enable environmental data sharing and availability.

The outdated notion that environmental protection conflicts with the economy is giving way to the realization that, especially in the maritime industry, the environment and the economy are intrinsically linked. As such, there is a need for innovative policies, technologies, and financing tools that promote collaboration, facilitate the integrated management of resources, foster partnerships between governments and industry,

encourage research and development in new technologies, and scale up investments across established and emerging sectors of the blue economy.

CREATING THE CONDITIONS FOR SUSTAINABLE GOVERNANCE

❖ Maritime Spatial Planning

The greater the demand for use of maritime space, the more crucial it is to have spatial planning. Maritime spatial planning is an essential tool to prevent conflict between policy priorities and to reconcile nature conservation with economic development. Public consultation involving both citizens and stakeholders is a fundamental part of the maritime spatial planning process.

❖ Citizen Engagement and Ocean Literacy

The policy for a sustainable blue economy will both encourage and be improved by citizen engagement. Citizens and especially young people highly value the health of seas and oceans and are supportive of a sustainable approach to them. Public concern for plastic litter in the oceans shows this, though it remains crucial to expand public awareness of the importance of seas and oceans for life on the planet. Modern mobile applications allow citizens to track, monitor or report on observed environmental damage.

❖ Sea Basins, Regional Cooperation and Support for Coastal Regions

Coastal regions and islands are key players in the blue economy. Because they often share the same sea basin, there is a clear added value in addressing common challenges and protecting common goods through regional cooperation.

❖ Maritime Security

A safe and secure maritime space is the prerequisite to preserving strategic interests such as freedom of navigation, external border control or the supply of essential materials and for protecting economic activities and citizens, both at sea and onshore.

ACTIONS TO GUIDE THE DEVELOPMENT OF BLUE ECONOMY

The different pathways toward the blue economy depend on national and local priorities and goals. Nevertheless, there are common steps that will be required by all countries aiming to adopt this approach to managing their oceans. Some of the elements needed for the transition to a blue economy are suggested and presented below.

- ✓ The effective implementation of the United Nations Convention on the Law of the Sea is a necessary aspect of promoting the blue economy concept worldwide. That convention sets out the legal framework within which all activities in the oceans and seas must be carried out, including the conservation and sustainable use of the oceans and their resources. The effective implementation of the Convention, its Implementing Agreements and other relevant instruments is essential to build robust legal and institutional frameworks, including for investment and business innovation. These frameworks will help achieve SDG and commitments, especially economic diversification, job creation, food security, poverty reduction, and economic development.
- ✓ Countries should value the contribution of natural oceanic capital to welfare in order to make the right policy decisions, including on trade-offs between different sectors of the blue economy, to ensure effective and sustainable management of different activities.
- ✓ Improved governance for the development of the blue economy. This is essential for the sustainable use of oceans, seas and marine resources, for the conservation of biodiversity, for improving human well-being and for the resilience of ecosystems.
- ✓ Investment in, and use of the best available science, data, and technology is critical. The use of science, data and technology is vital to support governance reforms and formulate management decisions.
- ✓ Each country should weigh the relative importance of each sector of the blue economy and decide, based on its own priorities and circumstances, which ones to prioritize. This prioritization can be carried out through appropriate investments and should be based on accurate valuation of its national capital, natural, human and productive.

- ✓ Anticipating and adapting to the impacts of climate change is an essential component of a blue economy approach. National investments to that end must be complemented by regional and global cooperation around shared priorities and objectives.
- ✓ Innovative financing to direct investment towards economic activities that can enhance the health of the oceans. Blue bonds, insurance and debt-for-adaptation swaps can help leverage this investment in order to ensure that it maximizes a triple bottom line in terms of financial, social, and environmental returns. Blue bonds can finance blue economy projects that contribute to the good governance of the oceans and coastal habitats and strengthen the resilience and livelihoods of people who depend on oceans and their resources.
- ✓ Realizing the full potential of the blue economy also requires the effective inclusion and active participation of all societal groups, especially women, young people, local communities, indigenous peoples, and marginalized or underrepresented groups. In this context, traditional knowledge and practices can also provide culturally appropriate approaches for supporting improved governance.
- ✓ Developing coastal and marine spatial plans (CMSP) is an important step to guide decision-making for the blue economy, and for resolving conflicts over ocean space. CMSP brings a spatial dimension to the regulation of marine activities by helping to establish geographical patterns of sea uses within a given area. Digital mapping of the marine environment and coastal space and natural assets can in turn provide the basis for cross-sectoral analysis and planning to prevent conflicts and avoid externalities.
- ✓ The private sector can and must play a key role in the blue economy. Business is the engine for trade, economic growth and jobs, which are critical to poverty reduction.
- ✓ In view of the challenges facing SIDS and coastal LDCs, partnerships can be looked at as a way to enhance capacity building. Such partnerships already exist in more established sectors, such as fisheries, maritime transport, and tourism, but they are less evident in newer and emerging sectors. There is thus an opportunity to develop additional partnerships to support national, regional, and international efforts in emerging industries, such as deep-sea mining, marine biotechnology, and renewable ocean energy. The goal of such partnerships is to

agree on common goals, build government and workforce capacity in the SIDS and coastal LDCs.

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