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INNOVATIVE OCEANS

DRIVERS OF INTERNATIONALISATION FOR THE EU
OUTERMOST REGIONS

OECD DEVELOPMENT POLICY PAPERS

October 2023 **No. 51**



OECD Development Policy Papers
October 2023 – No. 51

Innovative oceans

Drivers of internationalisation
for the EU Outermost Regions

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This document was authorised for publication by Ragnheiður Elín Árnadóttir, Director of the OECD Development Centre.

Keywords: global value chains; regional economic activity; sustainable ocean; EU Outermost Regions

JEL classification: O52, O54, O55, Q2, Q22, Q25, Q57, R11, R58

Abstract

This paper provides an overview of the ocean economy in the EU Outermost Regions (EU ORs). It discusses the opportunities and challenges that the EU ORs are facing in light of emerging global trends, laying out priority actions for making the ocean a factor of competitiveness and internationalisation. Such actions could be taken together with EU and basin-specific partners such as Small Island Developing States in the Caribbean, Atlantic and Indian Ocean. The paper is developed within the framework of the EU-OECD project on Global Outermost Regions.

Foreword

The global economic landscape is uncertain, complex and fast changing. Governments, businesses and societies are endeavouring to better understand and, ultimately, govern the ongoing reorganisation of global trade with a view to optimising international exchanges, preserving openness and inclusiveness, while achieving an environmental and sustainable transition.

This paper is part of the OECD-EU project on “Transforming economies in EU outermost regions (EU ORs): fostering learning and making the most of global interconnectedness”, funded by the European Commission Directorate General for Regional and Urban Policy. Between 2021 and 2023, this project has supported a process of dialogue and knowledge sharing between EU ORs and international partners to identify opportunities for sustainable value creation and enhanced participation in global and regional value chains.

The European Outermost Regions (EU ORs) are EU member states’ territories located in the Atlantic Ocean, Caribbean basin, South America and the Indian Ocean and they are an integral part of the Union. They include Guadeloupe, French Guiana, Martinique, Réunion, Saint-Martin and Mayotte (France), the Azores and Madeira (Portugal), and the Canary Islands (Spain). Due to their remoteness, insularity, small size, difficult topography and climate they benefit from targeted support measures. Thanks to their distinctive characteristics and assets, including a rich biodiversity and strategic location, the EU ORs can play an important role in the overarching EU internationalisation and co-operation strategy and policy.

This paper provides an overview of the ocean economy in the EU Outermost Regions (EU ORs), revealing their unique strengths and growth opportunities. The study emphasises the potential for international collaborations with a wide range of partners. It also clarifies future opportunities for increasing internationalisation and co-operation with partners beyond the EU, including neighbouring countries in Africa, Latin America and the Caribbean and other developing and emerging economies like Small Island Developing States (SIDS). Furthermore, the paper identifies opportunities for future reforms to make the most of the multi-annual planning and resources of the EU, including the Communication on “Putting people first, securing sustainable and inclusive growth, unlocking the potential of the EU’s outermost regions” adopted in 2022.

This paper is one of several outputs of the project, which include two Production Transformation Policy Reviews: Spotlight on the Azores’ and Guadeloupe’s internationalisation and four policy papers on the innovation and patenting, renewable energies, the agro-food sector, and cultural and creative sectors.

Acknowledgements

This paper was prepared by the OECD Development Centre, led by Ragnheiður Elín Árnadóttir, Director. It was drafted by Manuel Toselli, Economist, under the supervision of Annalisa Primi, Head of Economic and Transformation Division, OECD Development Centre.

The authors are grateful to the following colleagues from the European Commission Directorate General for Regional and Urban Policy for their strategic guidance during project implementation: Peter Berkowitz, Director of Policy, Nicola De Michelis, Director of Smart and Sustainable Growth and Programs Implementation, Paula Duarte Gaspar, Head, Outermost Regions Unit; Germán Esteban, Deputy Head, Outermost Regions Unit; Katherine Fournier-Leroux, Policy Coordinator, Outermost Regions Unit; and Catherine Wendt, Head, Smart and Sustainable Growth Unit. It benefited from comments and contributions from Piera Tortora, Head of Sustainable Ocean for All Initiative at the OECD Development and Co-operation Directorate and Claire Jolly Head, Ocean Economy and Space Economy at the Directorate for Science, Technology and Innovation.

This report also benefited from information provided by the policy makers and experts in the EU Outermost Regions: Guadeloupe, French Guiana, Martinique, Réunion, Saint-Martin, and Mayotte (France); the Azores and Madeira (Portugal); and the Canary Islands (Spain).

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Abbreviations and acronyms

ADEME	French Agency for Ecological Transition
AFD	French Development Agency
ANR	French National Research Agency
ECEA	Canarian Blue Economy Strategy 2030
EEZ	Exclusive economic zone
EMFAF	European Maritime, Fisheries and Aquaculture Fund
ERDF	European Regional Development Fund
ESF	European Social Fund
EU	European Union
FDI	Foreign direct investment
FPV	Solar photovoltaic energy
GDP	Gross domestic product
GVA	Gross value added
ICT	Information and communication technologies
IEA	International Energy Agency
IEDOM	<i>Institute d'émission des départements d'outre-mer</i>
Interreg	European Territorial Cooperation
IRENA	International Renewable Energy Agency
IUCN	International Union for Conservation of Nature
MSP	Marine Spatial Planning
MW	Megawatt
OCTs	Overseas Countries and Territories
OECD	Organisation for Economic Co-operation and Development
OR	Outermost Region
OTEC	Ocean Thermal Energy Conversion
SIDS	Small Island Development States
SNA	System of National Accounts
SRDEII	Regional Scheme for Economic Development, Innovation and Internationalisation
STI	Science, technology, and innovation
SUTs	Supply and use tables
TAC	Total allowable catch
UNCLOS	United Nations Convention on the Law of the Sea

Executive summary

The European Outermost Regions (EU ORs) hold a unique position in the Atlantic Ocean, Caribbean basin, South America, and the Indian Ocean. Their extensive maritime economic zones, rich biodiversity, and natural assets make them fertile ground for scientific and innovative pursuits. Despite socio-economic heterogeneity, these regions share common challenges such as geographical remoteness, limited size, and climate change vulnerability, akin to neighbouring territories. This policy paper, developed under the EU-OECD project on Global Outermost Regions, casts a spotlight on the ocean economy within the EU ORs. It provides a snapshot of ocean economy development, explores emerging global trends, and outlines opportunities and challenges.

The EU ORs recognise the ocean as a resource both to utilise and preserve. This duality underscores their commitment to sustainable practices while reaping the economic benefits offered by the ocean. As they navigate this delicate balance, the EU ORs are poised to become vital players in the global blue economy. The ocean economy is not merely a pillar of the EU ORs' economic development, it possesses the transformative potential to rejuvenate local economies through innovation-driven international partnerships. The EU ORs are pivotal to the future of the EU and the global sustainable blue economy. Empowering their participation in international forums and agreements is imperative to unlock their potential as providers of global solutions and facilitators of tailored local development strategies.

The ocean economy acts as an engine for economic growth, generating employment opportunities and facilitating the creation of value chains in the EU ORs. As these regions embark on value-added activities within the maritime sector, they stand to reap the rewards of innovative and sustainable practices. The EU ORs are well-positioned to leverage emerging high-value activities within the ocean economy. From renewable energy to advanced marine technologies, these regions can harness their natural assets to propel themselves into lucrative and innovative sectors.

The paper sets forth priority actions for harnessing the ocean's potential as a driver of competitiveness and internationalisation, in partnership with the EU and basin-specific collaborators, including Small Island Developing States (SIDS) in the Caribbean, Atlantic, and Indian Ocean.

- Prioritising sustainability. Sustainability lies at the core of the EU ORs' approach to the ocean economy. Balancing economic growth with environmental preservation is a top priority. Sustainable practices not only safeguard the delicate marine ecosystems but also ensure the long-term viability of ocean-related industries.
- Investing in science, research, and innovation. Investing in those areas is fundamental to the EU ORs' journey towards a vibrant ocean economy. Collaborative research efforts, technology development, and knowledge sharing will drive progress in the maritime sector.
- Nurturing the next generation of talents. A critical aspect of advancing the ocean economy in the EU ORs is nurturing the next generation of talents. Fostering a skilled workforce and creating educational pathways for innovative ocean-related careers is essential for long-term success.
- Global ocean economy leadership. The EU ORs aspire to become key players in the global ocean economy. Their strategic geographical positioning and unique assets make them valuable contributors to a sustainable, innovative, and inclusive ocean economy.

1 Introduction

This paper provides a snapshot of the development of the ocean economies in the EU Outermost Regions (EU ORs) vis-à-vis global trends. The EU ORs are Guadeloupe, French Guiana, Martinique, Réunion, Saint-Martin and Mayotte, (France); the Azores and Madeira (Portugal); and the Canary Islands (Spain).

The EU ORs are often considered peripheral areas with limited resources due to their geographical conditions. They are located far away from major centres of production, which can make it difficult for them to attract foreign direct investment (FDI), develop strong trade links or establish local value chains (OECD/The World Bank, 2016^[1]; OECD, 2018^[2]). The ocean economy transforms the peripheral nature of these regions and makes them the centre of a key industry for the future. The ocean is a valuable asset that should be used in a sustainable way – and the EU ORs have a major stake in the debate on the future of the ocean economy.

This paper is structured in three sections: first, it provides a brief overview of the ocean as an economic and environmental asset; second, it reviews the ocean economy in the EU ORs in a comparative way; third, it identifies key policy priorities going forward. The paper highlights the key role of the ocean economy as a driver of internationalisation, research and business innovation in the EU ORs.

2 The ocean is a resource to valorise and preserve

The ocean is an essential natural and economic resource in which local and global communities have major stakes. Being unique reservoirs of biodiversity, the ocean holds 97% of the planet's water, covering more than 70% of the Earth's surface. It is home to 80% of all life forms. As one of the world's largest carbon reserves, the ocean produces half of our oxygen and is also a major source of economic growth and employment (European Commission, 2022^[3]).

Several economic activities are associated with the ocean economy, including traditional industries, such as the extraction and exploitation of marine living and non-living resources, maritime transport and coastal tourism, as well as fast and innovative growth activities related to oceanic renewable energy, biotechnology and bio economy (Jolliffe, Jolly and Stevens, 2021^[4]).

Recognised as an important source of economic growth and employment, the development of the world's oceans also encompasses a set of challenges related to its sustainable exploitation. Over-exploitation of fishing resources, pollution associated with human activity, and climate change all contribute to undermining both the long-term stabilising effects of the ocean and the socio-economic gains that they can yield (OECD, 2019^[5]). Globally, several initiatives are rapidly emerging to face these challenges. These include the Sustainable Development Goal (SDG) for managing and protecting marine and coastal ecosystems (SDG 14). Discussions at the G20 level, led by Indonesia in 2022, focused on the blue economy and the 2021 European Commission's new approach for a sustainable blue economy in the EU. The plan, as part of the European Green Deal, aims to provide guidelines across the blue economy sector within EU ORs. It facilitates their coexistence and looks for synergies in the maritime space, without damaging the environment (European Commission, 2022^[6]).

The value of the global ocean economy is expected to double by 2030. According to OECD estimates, ocean-related economic activities are projected to double in 20 years, from USD 1.5 trillion in 2010 to USD 3 trillion by 2030 (OECD, 2016^[7]), the equivalent of the GDP of France in 2020. Their impact and incidence vary according to the level of development and their economic structure. For high-income countries, the so-called blue economy accounts for less than 2% of GDP. In 2018, for example, the EU27 ocean economy directly employed almost 4.5 million people (2.3% of workforce) and generated around USD 200 billion of gross value added (1.5% of GDP) (European Commission, 2021^[8]). These countries tend to have a relatively larger contribution from high value-added sectors, such as scientific and innovation activities. For low-income countries, their contribution to GDP is on average 11% and 6% respectively. These countries tend to be more specialised in low value-added segments and their marine activities face greater risks from rapidly deteriorating marine ecosystems (OECD, 2020^[9]).

During the last decade, the ocean has become a priority area for policymakers in many developed and emerging economies, including for the EU ORs. Recognised as an important source of economic growth and employment, the development of ocean-related activities also encompasses a set of challenges related to its sustainable exploitation. Over-exploitation of fishing resources, pollution associated with human activity, and climate change all contribute to undermining both the long-term stabilising effects of the ocean and the socio-economic gains that they can yield (OECD, 2019^[5]).

3 Oceans are an important driver of internationalisation and competitiveness for the EU ORs

Oceans represent more than 75% of the territories of the EU ORs. They are a key economic and internationalisation asset, on top of being a strategic resource to preserve (Box 1). In the EU ORs and their neighbouring countries, in the Atlantic Ocean, the Caribbean basin and the Indian ocean, the sea accounts, on average, for more than 75% of total territories (Figure 1). In addition, the economic boundaries of the EU ORs are often linked to large Exclusive Economic Zones (EEZs), which are critical competitive assets for the local economy. For example, while the Azores represent only 2.5% of the total land of Portugal, its EEZ of nearly 1 million km² represents 60% of the total Portuguese EEZ. The EEZ of Réunion with 315 000 km² is as large as the entire EEZ of continental France. These vast ocean zones host unique biodiversity hotspots, which can be important sources of competitiveness, innovation and internationalisation. However, they are also increasingly vulnerable and exposed to the impacts of climate change. Multilateral initiatives such as the United Nations High Seas Treaty, which was approved in 2023, aims to support the conservation and sustainable use of marine biological diversity in areas beyond national jurisdiction (United Nations, 2023^[10]).

The 2022 Commission Communication recognises the relevance of the maritime economy for these regions. It emphasises the need to leverage on the significant EEZs of the EU ORs to pilot and scale up business and innovation opportunities linked to the blue economy, also in partnership with third countries in the geographical areas in which they are located and on a global scale (European Commission, 2022^[6]).

Box 1. The EU Atlantic Action Plan 2.0: Towards a resilient and competitive blue economy

An updated action plan for a sustainable, resilient and competitive blue economy in the European Union Atlantic area

The original EU Atlantic Maritime Strategy was adopted in 2011 by the European Commission to support the sustainable development of the blue economy in the EU member states bordering the Atlantic. The EU ORs in Macaronesia and in the Caribbean are explicitly included in this strategy. The European Commission put forward an Atlantic action plan in 2013 to implement the strategy. It adopted a revised Atlantic Action Plan 2.0 in July 2020, further to a mid-term review of the Atlantic Action Plan published in 2018 by the European Commission to give renewed impetus to a sustainable maritime economy and to contribute to Europe's recovery from the crisis triggered by the COVID-19 pandemic.

The AAP 2.0 includes four pillars that aim to contribute to greater territorial co-operation in the Atlantic area, following a bottom-up stakeholder consultation. Its purpose is to unlock the potential of a sustainable blue economy in the Atlantic region while preserving marine ecosystems and contributing to climate change adaptation and mitigation. This is in line with the global commitments for sustainable development and are fully integrated in the European Commission’s political priorities for 2019-24, notably a European Green Deal, an economy that works for people and a stronger Europe in the world.

- Pillar i: ports as gateways and hubs for the blue economy.
- Pillar ii: blue skills of the future and ocean literacy.
- Pillar iii: marine renewable energy.
- Pillar iv: healthy ocean and resilient coasts.

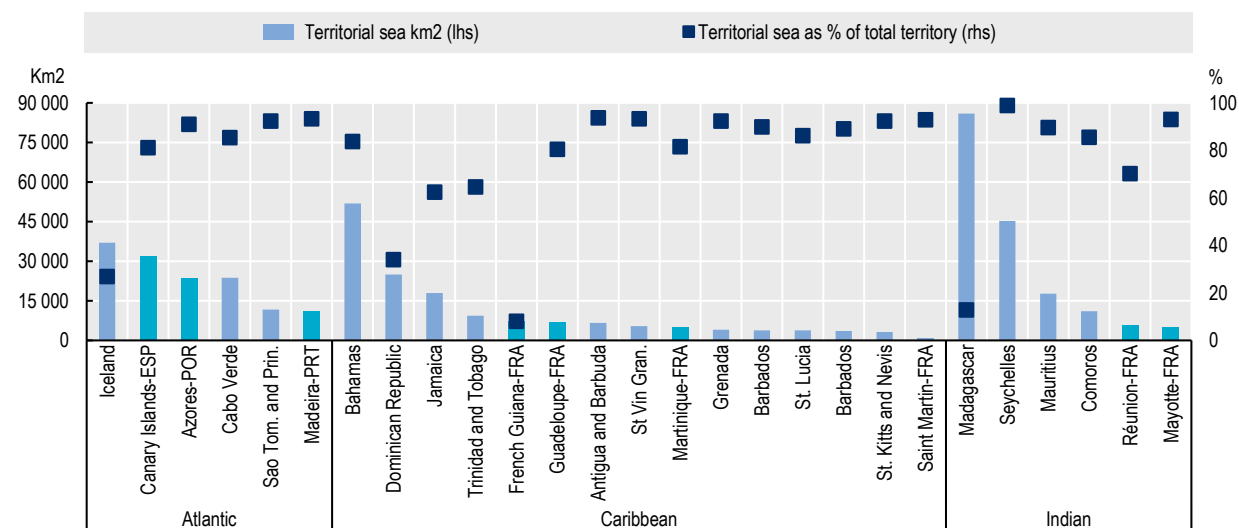
The Action Plan 2.0 is implemented through the Atlantic Assistance Mechanism which supports the three existing sea basin strategies.

Although no funding has been earmarked in the EU budget for the Atlantic action plan, it relies on the existing EU, national and regional funds and financing instruments relevant to the goals and actions that can be mobilised.

Source: European Union (n.d.^[11]), “A new approach to the Atlantic maritime strategy – Atlantic action plan 2.0 An updated action plan for a sustainable, resilient and competitive blue economy in the European Union Atlantic area”, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2020:329:FIN>.

Figure 1. Territorial sea accounts for the vast majority of territories in the outermost regions

EU ORs and selected countries, 2019



Note: The notion of “territorial sea” follows the United Nations Convention on the Law of the Sea (UNCLOS) that establishes a legal framework for territorial sea out to 12 nautical miles (22 kilometres; 14 miles) from the mainland.

Source: Based on Flanders Marine Institute (2019^[12]), *Maritime Boundaries Geodatabase, Version 11*, <https://doi.org/10.14284/382>; FAO (2023^[13]), *FAOSTAT Data*, <https://www.fao.org/faostat/en/#data>; INSEE (2023^[14]), *Homepage*, <https://www.insee.fr>; INE (2023^[15]), *Homepage*, <https://www.ine.es>; INE (n.d.^[16]), *Homepage*, <https://ine.pt/>.

A source of economic growth, employment, and value chain creation for the EU ORs

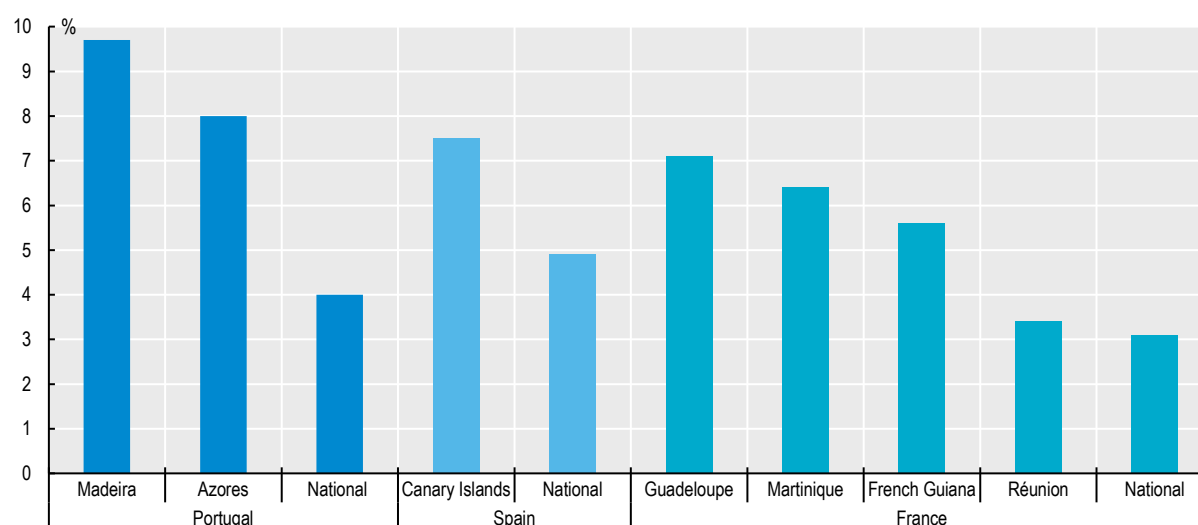
Oceans are key development drivers for the EU ORs. Given their natural characteristics, despite the different methodologies and reference years¹ (Box 2), the relevance of the ocean economy is higher for the EU ORs than for their respective national continental territories (Figure 2). For example, according to the most recent data of the Portuguese Ocean Satellite Account in 2018, the incidence of the ocean economy in the Azores and in Madeira in terms of gross value added (GVA) is 7.5% and 10.3%, respectively, versus a national average of 3.9%. Furthermore, in the Azores and Madeira, the share of employment in the ocean economy is 4% and 9.7%, respectively. This is more than double the national average (INE, 2020_[17]). Moreover, the two Portuguese EU ORs account, together, for 12% of the GVA and 11% of the jobs generated by the ocean economy in Portugal. Similar figures apply to other EU ORs. In the Canary Islands, the ocean economy contributed to 6.2% of GDP and 7% of employment in 2020 (Cetecima, 2021_[18]). The situation is similar in the French EU ORs where maritime activities account for between 7.1% (Guadeloupe) and 3.4% (Réunion) of local employment, whereas the average of employment generated by ocean activities in mainland France stands at 2.9%. Together, the French EU ORs contribute to 6.5% of the total employment in the ocean economy of France. Excluding tourism, the number of companies in the EU ORs operating in activities associated with the ocean remains higher than that of France as a whole at 0.4%. Mayotte has the largest relative number of enterprises associated with maritime activities with 2.5%, followed by Guadeloupe, Martinique and French Guiana with 2.4%, 2.3% and 1.3% respectively (IEDOM, 2018_[19]).

Most ocean economic activities in the EU ORs are related to traditional value chains linked to tourism, transport, and fishing and aquaculture. Although the specific regional and national differences in measurement, three value chains stand out as the main contributors to the EU ORs' ocean economies. Moving ahead, the harmonisation for measuring the value and impact of ocean economies to inform policy-making will be advisable. Both the OECD and the EU are implementing exercises in this respect through the use of satellite accounts (Box 2) or by providing a comprehensive and integrated approach to data collection such as the EU Observatory on the Blue Economy launched in 2022 (European Commission, 2022_[20]).

¹ The economic relevance of the Ocean Economy of the EU ORs is not comparable between regions as the methodologies used for each country differ considerably. The Portuguese Ocean Satellite Account uses a broader definition that also includes coastal tourism whereas in the Canaries only nautical tourism is considered. For the French EU ORs, the data reported here leverage on two distinctive sources. Employment data refers to a study launched in 2013 from the French National Statistical office (Insee) that also included tourism. This study has been updated recently only for Réunion (2018) whereas the information for the other EU ORs date back to 2013. The data on the number of enterprises refers to a 2018 study launched by the *Institute d'émission des départements d'outre-mer (IEDOM)* of the Bank of France. The OECD STI Ocean Economy Group is working on the harmonisation of ocean economy satellite account directed at the construction of ocean economy Supply and Use Tables (SUTs) across a number of OECD pilots. More information in Jolliffe, Jolly and Stevens (2021_[4]).

Figure 2. The EU ORs have larger shares of employment in ocean activities than national averages

Share of employment in ocean-related activities, EU ORs and national averages, 2020 or last available year



Note: Due to different methodologies and reference years, caution should be taken for cross-territorial and cross-country comparison.

Source: INE (2019^[21]), *Portugal Ocean Satellite Account – 2016-2018*, <https://www.ine.pt>; INSEE (INSEE, 2021^[22]), *L'économie maritime : des activités diverses et localisées*, <https://www.insee.fr/fr/statistiques/1560263>; IEDOM (2019^[23]), *L'économie bleue dans l'Outre-mer*, https://www.iedom.fr/IMG/pdf/iedom_economie_de_la_mer_2018.pdf; INSEE (2018^[24]), *Économie bleue à Réunion*, <https://www.insee.fr/fr/statistiques/6533648#onglet-2>; CETECIMA (2022^[25]), *Informe de Actividad de la Economía Azul en Canarias 2021*, <https://www.cetecima.com/publicacion-del-informe-de-actividad-de-la-economia-azul-en-canarias-2021/>.

Box 2. The OECD Blueprint for improved measurement of the international ocean economy

Exploring satellite accounts for measuring ocean economic activities

Measurements of ocean-related activities need to be systematic, comprehensive and regular, including at regional level, to facilitate better management of oceanic resources, identify new market opportunities and enable better policy implementation and monitoring. Supporting and scaling up national initiatives to address information gaps across the ocean value chain will be paramount. Portugal's National Institute of Statistics, for example, was one of the first to adopt a Satellite Account for the Seas. International initiatives are also emerging to bridge the data gap.

While several countries including Australia, France, Portugal, the United States and the EU use different methodologies and definitions to measure the size and impact of ocean economies, no international guidelines currently exist. Current OECD work on definitions and methodologies for ocean economy satellite accounts supports broader international discussions in the framework of the United Nations and the System of Environmental-Economic Accounting (SEEA) ocean account activities ("SEEA Ocean").

The departing point for an accurate and reliable data is the 2008 System of National Accounts (2008 SNA), an internationally agreed set of accounting guidelines for national economic statistics. All OECD countries and most non-members produce their national accounts in concordance with the 2008 SNA (or earlier versions). The SNA provides a powerful tool for measuring the ocean economy in a consistent manner and with comparable economic statistics nationally and internationally. The SNA also outlines the basic principles for adapting national accounts to specific sectoral- satellite- analysis while

maintaining coherence with the core structure by means of Supply and Use Tables (SUTs) which detail the flows of goods and services between producers and consumers in an economy. SUTs are the accounting mechanisms used by national accountants to estimate key indicators of EU ORs' economic performance including gross domestic product (GDP). Two types of satellite account are possible to implement.

1. The first, the premise of the core accounts is maintained but additional detail is provided for a particular sector or phenomenon.
2. The second type gives greater flexibility by allowing traditionally non-market goods and services within to be included.

The ocean economy satellite account under discussion is related to the first type. The production boundary of the 2008 SNA is maintained for the compilation of a thematic satellite account for ocean economic activity. This exercise follows previous experimentation such as 2008 Tourism Satellite Account: Recommended Methodological Framework

Source: Jolliffe, J., C. Jolly and B. Stevens (2021^[4]), "Blueprint for improved measurement of the international ocean economy: An exploration of satellite accounting for ocean economic activity", <https://doi.org/10.1787/aff5375b-en>.

Coastal and nautical tourism

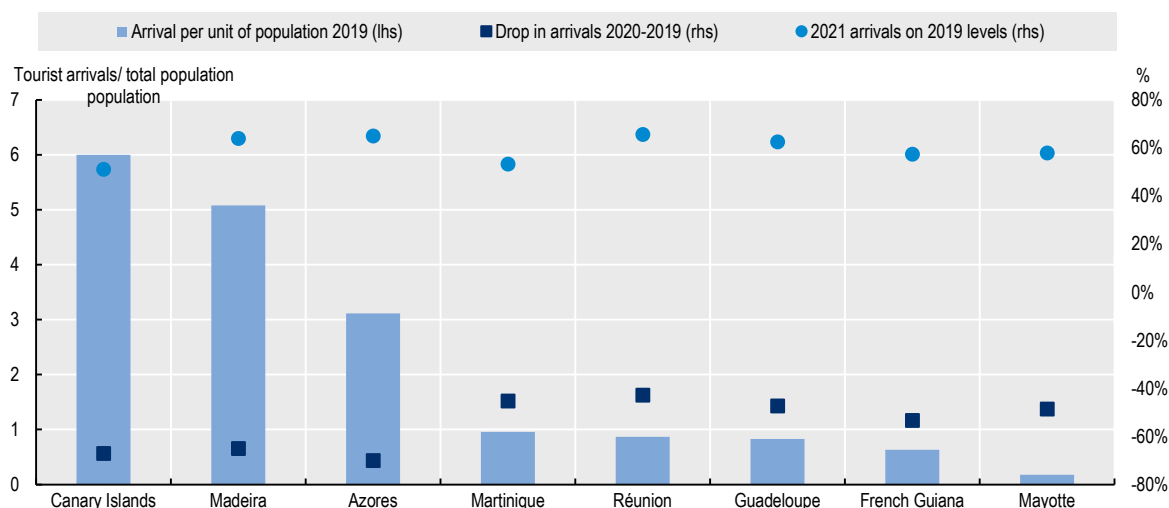
Given the natural and geographical characteristics of the EU ORs, tourism activities linked to the sea represent the backbone of the economies of some EU ORs, and for others they are a growing reality.

In the EU ORs, the tourism component of the ocean economy is strongly linked to the preservation and exploitation of the unique natural assets of these regions. In Madeira, Martinique and Réunion, coastal tourism accounts for more than 70% of ocean gross value added, whereas it accounts for more than 40% in Guadeloupe and in the Azores (Cetecima, 2021^[18]; Insee, 2022^[26]; INE, 2020^[27]). The Macaronesia region, which includes the Azores, Madeira and the Canary Islands, hosts three UNESCO Natural World Heritages sites and 12 UNESCO Biosphere Reserves. While the Azores are emerging as a new tourist destination with tourist arrivals doubling between 2014 and 2018, Madeira and the Canary Islands are longstanding tourist destinations due to the favourable climate all year long and increasingly available leisure and recreational opportunities. Madeira, with 4.4 million overnight stays, is the third main destination of coastal tourism in Portugal after Algarve and Lisbon in 2021. With 15 million arrivals in 2022, the Canary Islands are the second-biggest tourism destination in Spain after Cataluña (INE, 2023^[28]). In the Caribbean basin, the mangroves and mudflats along the coastline of French Guiana are considered to be some of the most extensive and structurally complex mangrove global ecosystems, covering over 14 000 km² and around 90% of the coastal zones, and providing habitat for millions of wader birds (shorebirds) (IUCN, 2020^[29]). Encompassing 143 000 km² of ocean, the Agoa Sanctuary surrounding Martinique and Guadeloupe is located in the eastern Caribbean Sea and is designed to ensure the conservation of marine mammals in waters under French sovereignty and jurisdiction in the French West Indies. Saint Martin, Martinique and Guadeloupe are destinations of several Caribbean cruise routes. In Saint Martin, it is estimated that at least 1/3 of employment was associated directly or indirectly with tourism activities in 2019 (Insee, 2022^[30]), whereas Guadeloupe and Martinique provide leisure touristic activities associated with the ocean in addition to inland activities such as the rum tours. In the Indian Ocean, Mayotte is encapsulated in a double barrier reef with a world class marine lagoon of 1 100 km² that hosts 205 coral species and 20 species of marine mammals. With 1.5 million overnight stays, Réunion is the largest French OR in terms of tourism arrivals (Conseil Départemental de Mayotte, 2019^[31]).

Although coastal and nautical tourism generates important spillovers and pulling effects for the entire economies of these territories, it is also one the most exposed activities to external shocks. It also often

represents the primary factor of attractiveness of domestic and foreign capitals (OECD, 2022^[32]). The COVID-19 pandemic and the subsequent lockdowns imposed a huge stress on the industry (OECD, 2021^[33]). After a sharp drop of between 50% and 70% in total arrivals in 2020, tourism only partially rebounded in 2021 with total arrivals still below 65% of pre-pandemic levels (Figure 3). This translated into painful economic backlash, especially for those EU ORs that depend on tourism revenues, such as the Canary Islands and Madeira that saw their GDP contracting by 19% and 15% respectively.

Figure 3. Tourism rebounded partially in 2021 after COVID-19

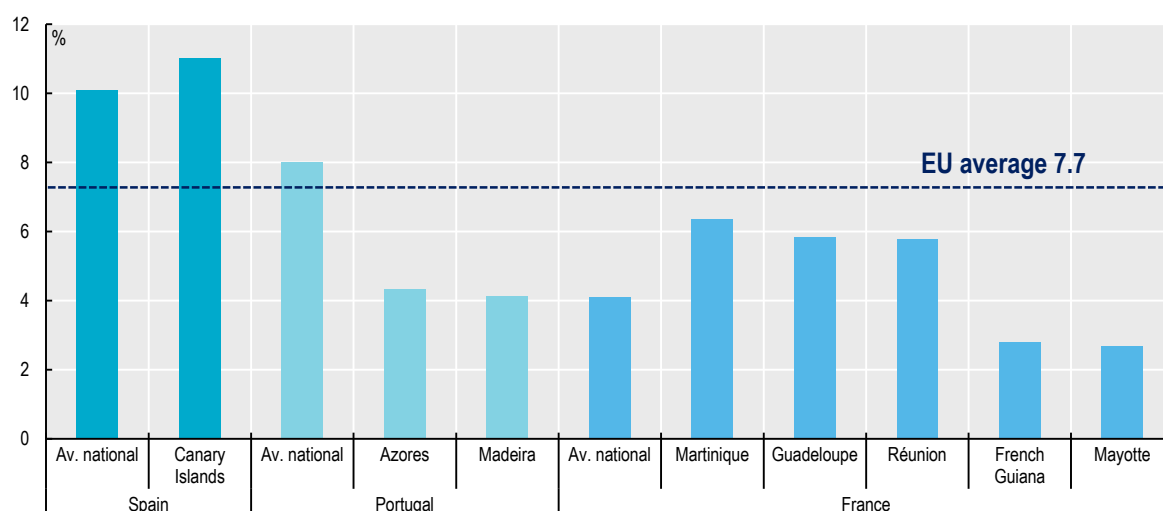


Source: Based on data from Eurostat and national statistical offices of Portugal, Spain and France.

Marine transport and ports

Marine transport and logistics are essential activities for the EU ORs. With 40 million tonnes, the EU ORs account for roughly 1% of total freight maritime transport in the EU. The Canary Islands are the leading marine transport hub among the EU ORs. Moving 24 million tonnes, bunkering operations are very relevant as the Port of Santa Cruz de Tenerife is one of the most important commercial hubs, at the crossroads of four different continents (Cetecima, 2021^[18]). Réunion is the second largest logistical hub among the EU ORs with 5 million tonnes. It has seen an increase of 25% of capacity over the last decade due to the modernisation and expansion of the Grand Port Maritime. Guadeloupe and Martinique, with around 2.3 and 2.2 million tonnes each (which was actually down 1 million tonnes compared to 2010), are facing fierce competition from neighbouring countries that are developing substantial logistical and maritime infrastructure activities in the Caribbean. The Azores registered 2 million tonnes, and Madeira and Mayotte 1 million tonnes each. The Portuguese EU ORs have been stable over time in terms of total unloaded and uploaded tonnes. The second terminal of the Longoni port in Mayotte inaugurated in 2010 facilitated this fast expansion. French Guiana and Saint Martin are the smallest hubs with 800 000 and 290 000 tonnes, respectively. Saint Martin's activities are managed at Marigot port, which nevertheless has limited capacity compared to the southern Dutch deep port of St Marteen, which accounts for 90% of total freight traffic in the island. The Canary Islands, the Azores and Saint Martin have the largest ports in term of tonnes per capita, ahead also of the respective national averages. This is related to several factors including cabotage services (internal transport) due to the need to serve several islands and the high dependence on imports for Saint Martin, which is the smallest EU OR (Figure 4). On average, between 70% to 80% of ports' activities are related to unloading operations, reflecting EU ORs' near-total reliance on imported goods (IEDOM, 2018^[19]).

Figure 4. Gross weight of seaborne freight handled per capita, EU, 2021 or last available year, Tonnes per capita



Note: Data for French Guiana refers to 2016.

Source: Based on Eurostat (n.d.^[34]), *Maritime Freight and Vessels Statistics*, <https://ec.europa.eu/eurostat> and National Port Authorities, 2023.

Fishing and aquaculture

In the EU ORs, two-thirds of fishing activities are concentrated in the Macaronesia region. Fishing policy is an exclusive competence area of the EU, and fishing activities are subject to total allowable catches (TACs) that are set annually based on scientific recommendations on the status of the stocks of various species. With an estimated 36 000 tonnes in 2019, the EU ORs contribute to 1.1% of the total catch in the EU. In particular, the Canary Islands, Azores and Madeira concentrate 75% of the pelagic fish stock, which includes tuna, mackerel and black scabbard, among other species. While the Canary Islands contribute to 1.3% of Spain's total fish landings (the largest EU Member State in terms of total landing), Madeira and Azores together account for 12% of Portugal. On average, EU ORs exports between 65% to 85% of fresh fish, given the relatively small regional market size. Some EU ORs have developed linkages between fishing and other economic activities, such as tourism. Madeira, along with the Canary Islands, have established recreative fishing activities that complement their local touristic offer.

Aquaculture is also an important activity for the Canary Islands, the second largest producer in Spain after the Valencian Community, with almost 8 000 tonnes mainly focused on sea bass and sea bream (Apromar, 2021^[35]). Among the French EU ORs, Guadeloupe in the Caribbean basin and Réunion in the Indian ocean landed respectively 3 100 and 2 800 tonnes in 2019, followed by French Guiana, Martinique, Mayotte and finally Saint Martin with a marginal 90 tonnes. Although in the Atlantic and in Réunion, some form of industrial fishing activities is present, the vast majority of catches are associated with artisanal and traditional fishing. Particularly, in the Caribbean basin, more than 90% of the fleet is composed of small-scale vessels (i.e. less than 10 meters long) that are mainly active in the coastal areas and supply exclusively the local market. This is not sufficient to cover demand, as 90% of consumed products are imported (IEDOM, 2018^[19]). Pressure on available marine resources and stocks considerably limits fishing activities in the Caribbean (European Commission, 2017^[36]).

Despite their differences, the EU ORs face common challenges, including the small business scale and persistent limited qualifications of fishermen, with little business management capacities that hinder diversification possibilities and fishing techniques. Likewise, infrastructure to support the development of non-fresh storage is lacking. Illegal fishing practices threaten the sustainability of the local fish value chains.

Moreover, the volatility in catches hampers investments in the downstream processing industry (ORFISH, 2016^[37]). These factors have, for example, affected fishing activities in French Guiana whose catches are 10% of those of nearby countries such as Suriname and Guiana. Once focusing on the shrimp market, the region saw catches fall dramatically due to external competition from Brazil and Ecuador, but also from emerging economies as Viet Nam and Bangladesh.

Emerging, high value-added activities can be beneficial for the EU ORs

The ocean economy has the potential to transform the local economies of the EU ORs through science, research and the piloting of new solutions in emerging activities, including the bioeconomy and renewable energies.

The ocean can play a key role in the scaling up of renewable energies. Offshore wind energy is becoming increasingly important. In 2021, it accounted for 0.1% of the world's renewable energy capacity, but rapid technological advancements in turbine technologies and energy storage and distribution are poised to increase its potential. In fact, installed capacity has already increased ten-fold in the last decade (IRENA, 2022^[38]; IEA, 2022^[39]). Emerging marine renewable energies include: floating offshore wind, wave and tidal energy, floating Solar Photovoltaic energy (FPV) and offshore hydrogen generation, all of which may help the EU meet its goals under the European Green Deal and the Communication on Energy Transition for EU Fisheries and Aquaculture adopted in 2023 (European Commission, 2022^[3]; Eur-Lex, 2023^[40]). Although still at an early technological stage, new methods to capture tidal currents and waves, thermal energy, and salinity gradients among others could transform the renewable energy landscape in the coming decades. The EU ORs have the potential to be key players in this transformation, not only as repositories of sources of renewable energies, but as co-creators and experimenters in developing new solutions in the field.

The EU ORs are already deploying certain capacities in marine renewable energies. The vast maritime and ocean territories of these regions provide fertile ground for piloting and scale-up offshore renewable technologies. For example, Ocean Thermal Energy Conversion (OTEC) pilots have been launched in Martinique and Réunion. In Martinique, a 16 MW power plant was planned to be operational in 2018, however the project was interrupted due to technical issues and lack of financing, whereas in Réunion, piloting is still ongoing (Interreg, 2019^[41]). At the same time, in the Azores the Pico Wave Power Plant – built in the 1990s as a testing pilot with the support of EU funds – was decommissioned in 2018 due to high repair costs after a partial collapse of the infrastructure. Revitalising these projects as well as piloting similar ones could represent important assets for the EU ORs. The Canary Islands and Réunion are also establishing new offshore winds and solar projects. In 2022, a floating wind prototype developed by a X1 Winds, a Barcelona-based start-up, has been installed at the PLOCAN test site in the Canary Islands. Réunion in the framework of its pluriannual energy programme is planning to develop an offshore wind turbine between 5 km and 10 km from the coast for a total installed capacity of 200 MW (Horizon Réunion, 2019^[42]).

The bioeconomy, which is defined as the capacity to generate sustainable economic value from natural assets, can provide new opportunities for business and value chain development in the ocean economy of the EU ORs. The ocean's biological and biomass resources (e.g. algae bacteria, fungi and invertebrates) can be transformed into final or intermediate products such as food fertilisers, pharmaceutical and cosmetics. This emerging market is expected to grow on average at 10% between 2022 and 2027 reaching a value of USD 4 billion (Tecnavio, 2022^[43]). Products like spirulina, a blue-green algae, is being cultivated worldwide, and used as a feed supplement in the aquaculture and poultry industries. It is being considered as a dietary support for long-term space flight. Also, fish biomass can be used to create by-products such as creams and cosmetics from enzymes. Moreover, the omega-3 oils that come from seafood or even fish leather from fish skins contribute to decreasing waste and help support the circular economy. Likewise, wastewater treatment with microalgae for biofuel production has both environmental and economic

benefits since microalgae are used as bio sorbents before biofuel production (Rudovica et al., 2021^[44]; Iceland Ocean Cluster, 2020^[45]).

In fact, the EU ORs are already developing value chains in marine bioeconomy. In the Canary Islands, over the last 20 years companies and start-ups have been transforming algae and seaweed to create products with enhanced sustainable value. For example, Seaweed Canarias SL, launched in 2001 as a spin-off of the University of Las Palmas, has launched patented innovative solution for the use of algae as agriculture fertilisers and for carbon capture processes (Cetecima, 2021^[18]). In 2019, the regional governments of Guadeloupe and Martinique in collaboration with the French Agency for Ecological Transition (ADEME) and the French National Research Agency (ANR) launched a call for projects to support the re-use of sargassum, which over the last decade has wreaked severe biological, ecological and economic havoc in the Caribbean. Financed projects include using sargassum as activated carbon to limit the negative effect of chlordecone in agriculture, which was an initiative spearheaded by the University of Antilles in Guadeloupe. Another project supported innovative enterprises that aim to transform the algae into building materials that have a minimal impact on the environment and energy resources (ADEME, 2021^[46]).

The EU ORs are unleashing the economic potential of their ocean in a sustainable way thanks to targeted policies

The EU ORs benefit from the growing attention of the EU to the potential of the Blue Economy. The EU has, in fact, embarked on an ambitious long-term effort to promote the sustainable development of ocean economies. Launched in 2021, the EU Sustainable Blue Economy Strategy replaced the former Blue Growth Strategy of 2012. Under the umbrella of the European Green Deal, it is an exhaustive action plan that aims to integrate sustainability and environmental aspects to the development of the blue economy in all Member States (Box 3).

The EU ORs are including support to the blue economy in their regional development strategies. The EU ORs enjoy the traditional support to fisheries and aquaculture of the European Maritime, Fisheries and Aquaculture Fund (EMFAF), which earmarked EUR 315 million for 2021-27 to the EU ORs (European Commission, 2022^[47]). In addition, other policy initiatives are emerging. Following a recommendation of the European Commission, the EU ORs are developing regional blue economy strategies in order to improve synergies between different public policies and to scale-up private investments. Between 2018 and 2021 all of the EU ORs developed blue economy diagnostic studies with the support of the Commission (European Commission, 2020^[48]). This led to different policy proposals and approaches, which are summarised below and in Table 1. Moreover, in 2022, a EUR 1 million call for flagship projects on blue economy in the Outermost Regions was launched with the aim to support projects that will develop an integrated approach to coastal and maritime tourism in the EU ORs.

- The Canary Islands, French Guiana and Mayotte have defined and formally approved ad-hoc and specific Blue Economy Strategies. Mayotte has provided 46 priority actions with details on financing and governance mechanisms (which have yet to be defined), and the Canary Islands have developed comprehensive strategies that encompass detailed actions, financing and management mechanisms.
- The other EU ORs are in the process of defining and elaborating their Blue Economy Strategies, which are expected to be adopted by the end of 2023.
- Réunion has incorporated specific lines of action related to the blue economy within a broader policy framework, the Regional Scheme for Economic Development, Innovation and Internationalisation (SRDEII), which was approved in April 2023 and contains specific actions on fishing, port development and Marine Spatial Planning (MSP).

- The Azores have also incorporated ad-hoc measures within the ERDF programme and National Recovery Resilient Strategy. They aim to develop a “Marine Cluster” (*Cluster do Mar dos Acores*) that should lead to the creation of an ocean experimental research and development centre on the island of Faial (Tecnopolo MARTEC) within the framework of the Portuguese National Strategy for the Sea 2021-2030 (*Estratégia Nacional para o MAR 2021-2030*).
- Martinique, Guadeloupe and Saint Martin have also developed the *Antilles Sea Basin Strategy* led by the prefect of Martinique and Guadeloupe. The document has a strong component on regional integration and environmental sustainability and is meant to inform and support regional authorities in the definition of specific policy measures to be financed within the framework of complementary national and EU policy frameworks such as France Relance and/or ERDF, ESF+ and EMFAF programmes.

Moving ahead it will be opportune to reiterate the need for an integrated approach to managing and governing ocean resources and avoid fragmentation or ad-hoc interventions (OECD, 2020^[9]).

Table 1. Sustainable blue strategies in the EU ORs: an overview as of February 2023

	OR	Strategy name	Period	Specificities and priorities	Financing mechanism	Leading authority
Specific regional blue strategies	Canary Islands	A blue economy strategy for the Canary Islands to 2030 (<i>Estrategia canaria de economía azul ECEA 2030</i>)	2021-30	13 priority sectors (including aquaculture, biotech, desalination, renewable) 5 strategic axes (R&D, human capital, competitiveness, maritime heritage, climate change)	EU: <i>ERDF, EMFAF, Horizon Europe, ESF, Interreg Spain: National Plan for R&D, National Energy Fund</i>	Regional Ministry of Economy, Knowledge and Employment
	Madeira	Strategic Plan of the Blue Economy of Madeira (<i>Plano Estratégico da Economia Azul da Madeira - ECONOMIAZULRAM</i>)	2021-30	9 priority sectors ORs (including tourism, transport, biotechnologies, energy, R&D and training)	EU: <i>ERDF, EMFAF, Horizon Europe, LIFE, Interreg (MAC and Atlantic), POSEI</i> , Portugal: <i>Blue Fund International: Ocean Conservation Funds, JPI Ocean</i>	Regional Secretary of Sea and Fisheries
	Mayotte	Blue Economy Development Strategy	2021-30	46 specific actions on 7 priority sectors (including fishing and aquaculture, tourism, renewables)	Not specifically mentioned	Mayotte Regional Council
	Réunion	Regional scheme for economic development, innovation and internationalisation (SRDEII)	2022-28	Fishing, aquaculture, port development Marine Spatial Planning (MSP)	Not specifically mentioned	Not specified
Blue initiatives with broader frameworks/initiatives	French Guiana	Regional and National Operational Programs 2021-27 ERDF & ESF and EMFAF	2021-29	Tourism, fishing aquaculture	EU: <i>ERDF, EMFAF, Horizon Europe, Interreg</i>	Not specified
	Azores	Regional and National Operational Programs 2021-27 ERDF & ESF and EMFAF	2021-29	Creation of Azores Sea cluster with R&D and innovation on fisheries,	EU: <i>ERDF, EMFAF, Horizon Europe, Interreg</i> Portugal: <i>Recovery</i>	Regional Directorate of Sea Affairs and Fisheries

	OR	Strategy name	Period	Specificities and priorities	Financing mechanism	Leading authority
				biotechnology, biomaterials	and Resilient Plan	
Basin blue strategy	Guadeloupe Saint-Martin Martinique + <i>Saint Barthelemy</i>	The Antilles Sea Basin Strategy	Not available	6 strategic axes (including regional co-operation, environmental protection and social inclusion)	Not specifically mentioned	Conseil Maritime Ultramarin du Bassin Antilles (Régional préfet of Guadeloupe and Martinique)

Source: Based on official national and regional documentations.

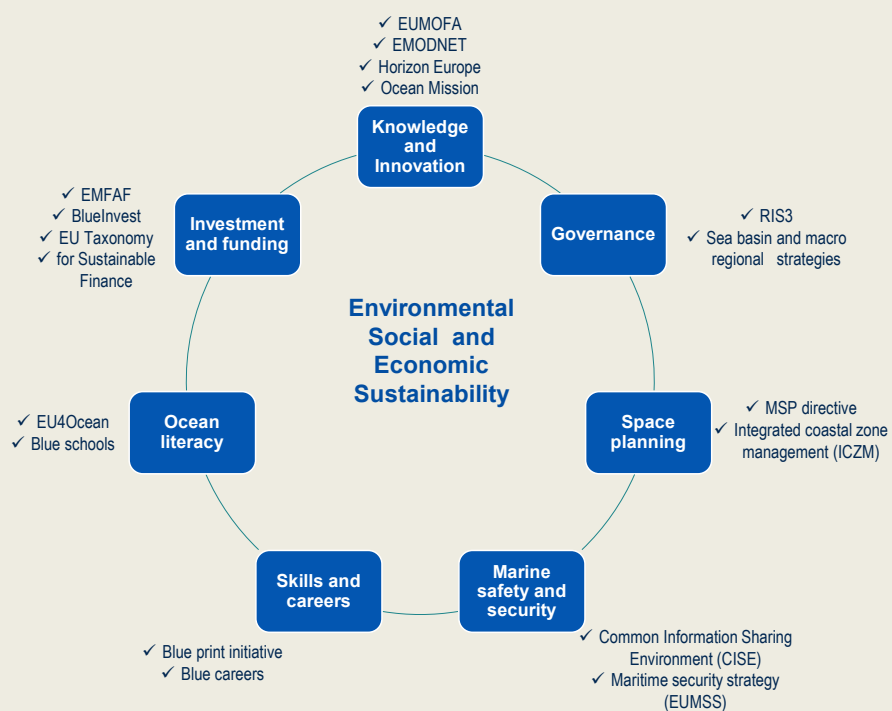
Box 3. The European Commission's new approach for a sustainable blue economy in the EU

The EU aspires to reduce greenhouse-gas emissions by at least 55% of 1990 levels by 2030 and become climate neutral by 2050. Many of the current activities need to reduce their carbon footprint, while new, carbon-neutral activities need to take centre stage. Launched in 2021 under the European Green Deal the new approach for a sustainable blue economy enables society to obtain value from the ocean and coastal regions, whilst respecting their long-term ability to regenerate and endure such activities through the implementation of sustainable practices.

Complementing other current Commission initiatives, the European Commission's communication for a sustainable blue economy in the EU includes several areas of intervention and financing mechanisms to support Member States and regions (Figure 5). Several value chains such as renewable energies, circular and bioeconomy and agri-food production are covered. Rather than an exhaustive action plan, the new approach provides coherence across the blue economy sectors, facilitates their coexistence and looks for synergies in the maritime space, without damaging the environment, thus underlining the need for investment in research, skills and innovation.

Investments in a sustainable ocean economy could represent positive returns with large multiplier effects. Recent estimates from the European Commission suggest that EUR 2.5 trillion in investment in 2022 on sustainable ocean-based solutions – offshore wind production, sustainable ocean-based food production, decarbonisation of international shipping, and conservation and restoration of mangroves – could yield a net benefit of EUR 14 trillion by 2050, which is a multiplier effect of nearly 6 times.

Figure 5. EU Sustainable Blue Economy strategy: Objectives, areas and initiatives



Source: Yakova, I. (2022^[49]), "Presentations at the Second Peer Learning Group (PLG) Meeting "Innovating Ocean", 3 March 2022", Deputy Head of Unit, DG MARE.

4 For an innovative and sustainable ocean in the EU ORs: Priorities going forward

Generating sustainable value from the ocean and preserving their unique natural ecosystems is a key priority for entire world and for the EU ORs in particular. The ocean economy represents a key internationalisation and innovation driver for these regions.

Sustainability

Our oceans face multiple sustainability challenges. Over-exploitation of fishing resources, pollution, and climate change all contribute to undermining both the long-term stabilising effects of the ocean, and the socio-economic gains that they can yield. Maritime transport also challenges ocean sustainability as well as traditional non green industrial activities and production methods.

The EU ORs are well placed to be key players in the quest for ensuring sustainability and preserving the world's oceans, while generating sustainable economic value from them.

Several of the EU ORs perform relatively well in the area of environmental protection with respect to the global average, particularly in terms of carbon storage and biodiversity protection (Figure 6). The EU ORs together with the Overseas Countries and Territories (OCTs) host more than 70% of European Union biodiversity and include 20% of the world's coral reefs and lagoons (Sieber, Borges and Burkhard, 2018^[50]; Petit and Prudent, 2008^[51]). These include 5 600 endemic marine and terrestrial species in Macaronesia, with the 4 000 km² of French Guiana's coastal zones providing habitat for one of the most pristine mangrove forests in the world. In the Indian Ocean, Réunion is home to biodiversity hotspots that host 3 500 animal species and 2 500 coral species. Also, the Canary Islands are home to 29 of the 81 species of whales, or some 36% of the world's whale population. Still several challenges persist. While some regions are also well placed in economic activities such as fishing and tourism, other regions, like the Caribbean ones, are facing more challenges due to longstanding issues. Caribbean reefs have suffered significant deterioration since the 1970s due to epizootic and coral diseases, over-fishing, and sediment pollution, which have also undermined the sustainability of fishing activities. At the same time, while cruise ship tourism attracts visitors across the Caribbean (around 15 million in 2018), the environmental impact in surrounding port areas poses myriad sustainability challenges, including CO₂ emissions, underwater noise pollution and the expansion of existing physical infrastructures (Life4best, 2018^[52]; Ajagunna, Ilori and McLean, 2022^[53]).

Figure 6. Oceanic health in the EU ORs: Assets and challenges

Ocean Health Index, EU outermost regions and global average, 2022

Area	Goal	Carribean			Atlantic			Indian		Global average
		Saint Martin	Guad. and Martin.	French Guiana	Madeira	Azores	Canary Islands	Mayotte	Réunion	
Environment	Biodiversity	90.5	87.7	77.6	80.9	81.2	70.5	88.5	80.4	76.3
	Coastal Protection	92.2	93.9	100.0	NA	100.0	66.1	95.7	88.2	82.4
	Carbon Storage	100.0	100.0	100.0	NA	NA	64.9	100.0	100.0	81.0
	Clean Waters	65.7	73.8	76.9	67.5	68.8	68.9	74.5	72.4	70.1
Economic	Artisanal Fishing Opportunity	61.7	64.5	76.9	97.3	85.2	88.5	80.8	85.4	76.9
	Livelihoods and Economies	88.4	62.8	44.0	79.8	84.2	57.4	100.0	67.5	80.8
	Food Provision	46.4	21.	32.0	76.8	65.8	73.7	76.5	59.2	50.3
	Tourism and Recreation	77.7	23.5	21.1	60.4	60.4	60.4	44.4	37.4	39.2
Identity	Sense of Place	81.0	81.7	83.2	79.8	60.9	79.8	75.8	37.5	61.0
	Natural Products	100.0	90.6	76.7	81.5	65.3	86.5	63.3	63.5	75.3
	Ocean Health Index	80.4	70.0	68.8	78.0	74.7	71.7	79.9	69.2	69.3

Note: Highlighted in red/green if the regional score belongs to the 1st/3rd quartile of the global index distribution.

Source: Based on NCEAS (2022^[54]), *Ocean Health Index Database 2022*, <https://github.com/OHI-Science/ohi-global/releases>.

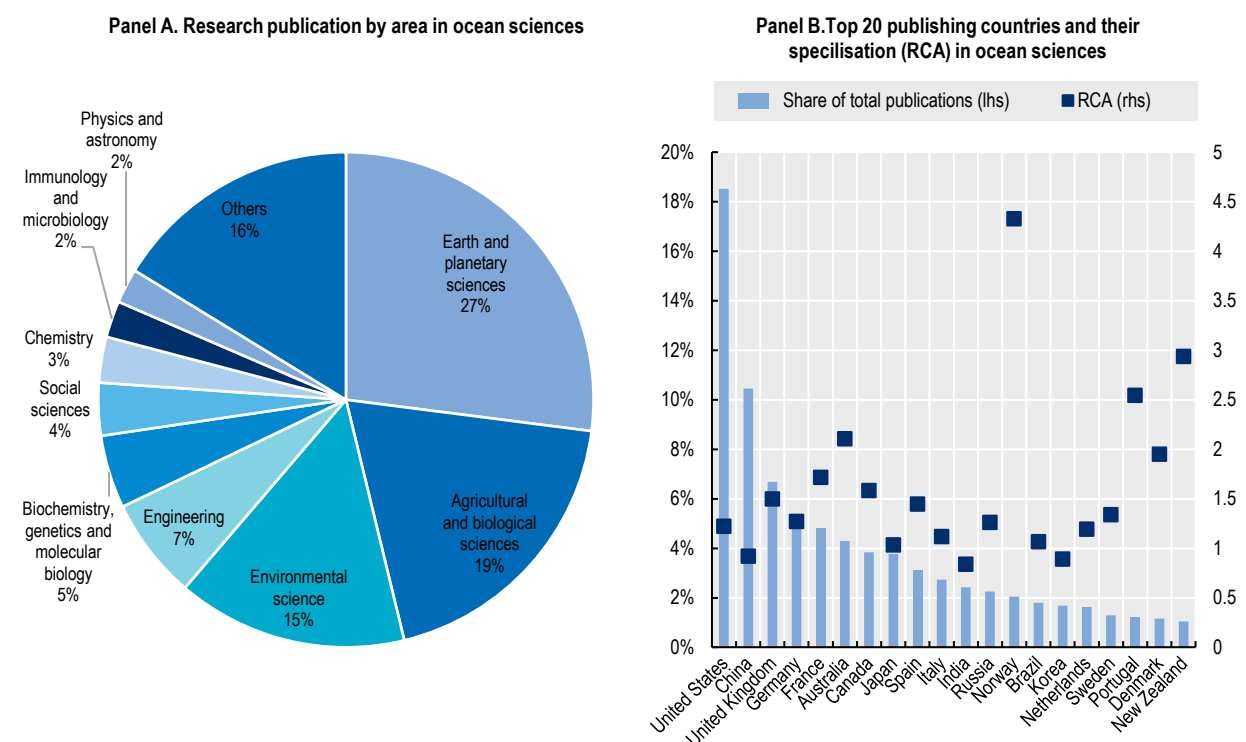
Science, R&D and innovation

Ocean-related innovation will play a pivotal role in shaping the direction of economic development of the EU ORs and in preserving their natural ecosystems. To reverse biodiversity loss and meet current climate change targets, countries at global level are looking to mobilise large investments, step up research and innovation efforts and mainstream the use of new and digital technologies, all of which require a greater effort in terms of research and innovation activities.

The global research effort related to the ocean has almost quadrupled in 20 years, from 11 000 in 2000 research publications to 42 000 in 2021. Some 60% of total research activities are concentrated in three scientific areas: earth and planetary sciences; agricultural and biological sciences; and environmental sciences. The United States are the leading country in terms of research publications, but several countries are also highly specialised in oceanic studies, including France, Portugal and Spain (Figure 7). The EU ORs contribute to the research activities of these countries by attracting resources and hosting research platforms. For example, the Azores contribute to 10% of total Portuguese research publications on ocean-related sciences. Moreover, 80% of total scientific publications by Azores' institutions are carried out in co-operation with other partners outside the region (including Madeira and the Canary Islands) that together represent the third-largest scientific partner after mainland Portugal, the United States and the United Kingdom. Conversely, the research institutions in Guadeloupe mainly co-operate with Mainland France institutions (82%) and to lesser extent with other regional partners (for more information, please refer to PTPR spotlights of Azores and Guadeloupe).

Ocean research and innovation efforts are benefiting from the combination of scientific disciplines and the emergence of new technologies. The emergence and combinations of new technologies such as physical sensors, advanced materials, autonomous systems, nanotechnology and subsea engineering are fostering the sustainable development of our oceans by increasing productivity and accuracy and facilitating sustainable methods and traceability. These include activities such as ocean floor mapping, smart shipping, and tracing fish stocks and fish products. In this respect, their potential resides in leveraging technology synergies across scientific disciplines and among different ocean sectors. The entire value chains of oceans can benefit from such development and provide new market opportunities. For example, maritime robotics, whose value is estimated at around USD 2.3 billion, is poised to double by 2025 (European Commission, 2022^[3]).

Figure 7. Research publications in ocean sciences, 2020-21



Note: For the extraction of ocean-related scientific publications, all scientific publications that contain the words “ocean”, “oceans”, “maritime” or “marine” in either their title, abstract or keywords were retrieved. Only final publications in a reference journal with at least one citation were included in the final dataset, which covered the years from 2000 to 2021.

Source: Based on Scopus (2022^[55]), Homepage, <https://www.scopus.com/>.

New technologies are also opening up opportunities for new and innovative activities in the areas of space science, biotechnology and the bioeconomy. For example, Nemo’s Garden, a US-based start-up is developing underwater greenhouse farming using local desalinated water and remote monitoring technologies. They can contribute to developing sustainable blue economies by preserving the environment and protecting biodiversity. In addition, they can also drive innovative activities related to oceans, which can boost new businesses in traditional and emerging sectors such as fishing, aquaculture, marine transport as well as the bio-economy, bio-technology and water desalination (OECD, 2019^[51]). ICT technologies can be applied to traditional sectors of the ocean economy such as ports and logistics. Launched within the framework of Interreg Baltic, the Connecting2small platform provides digital solutions such as mapping, testing and integrated infrastructure (e.g. digital twin technologies for small ports) in

order to increase predictability of maintenance and security. Other solutions such as 3D printed portable hydraulic turbines, from Vortex Hydrokinetic, a start-up from the Czech Republic currently located in Florida (United States), can generate electricity from limited water flows without using blades, which could be extremely useful for isolated areas. These are only a few examples of how new technologies applied to the ocean can be an important factor in enhancing competitiveness, including for the EU ORs.

Due to their global nature, ocean innovation activities are often the result of international networks in which public and private institutions interact and facilitate knowledge dissemination and flows by sharing financial resources, technologies and infrastructure facilities. Ocean-based clusters have flourished in the United States and Iceland as effective models and are gaining ground in the EU ORs as well (Box 4).

Box 4. Ocean clusters: Experiences from EU ORs, Iceland and the United States

EU ORs: The Canary Islands and the Azores

In the Canary Islands, PLOCAN is a consortium led by the public sector that provides technical-scientific service infrastructure and support for research, technological development and innovation in the marine and maritime sectors. It is available to public and private users. Co-funded since 2012 by the Science and Innovation Ministry of the Spanish government, the Canary Islands government and by the European Regional Development Fund (ERDF) Programme of the Canary Islands, 1 500 researchers from 40 countries have been involved in PLOCAN's activities related to monitoring oceanic ecosystems.

The Azores launched in 2020 Blue Azores, an international partnership between the Regional Government, the Oceano Azul Foundation and the Waitt Institute that aims to protect marine reserves by implementing management plans for the new marine reserves and improve fisheries' capacities. These exercises should be scaled-up and kept open to new partners in other EU ORs where recently the private sector has made efforts through the French Maritime Cluster but where public authorities and local universities have failed to make a concrete contribution.

Iceland

Iceland, the second largest producer of seafood in Europe after Norway, has been transforming its fishing industry through the emergence of a vibrant start-up culture with strong connections to local marine-related businesses, academia and the public sector. Icelandic start-ups have developed new innovations based on fishing products that aim to add more value and minimise catch waste. One relevant example is Kerecis, a start-up developed in 2013 that develops skin grafts from fish skins. Connecting stakeholders to identify and exploit new market opportunities (while mobilising private and public sector investment to plug the financing gap) has been central to Iceland's experience. The Iceland Ocean Cluster, for example, was established in 2011 as a privately-held consortium with the aim to connect entrepreneurs and knowledge partners in ocean-related economic activities. It operates largely as an accelerator and provides networking and other services to businesses, while it also invests resources in new projects. The Cluster has fostered more than 120 start-ups since its establishment and focuses on 100% use of fish biomass.

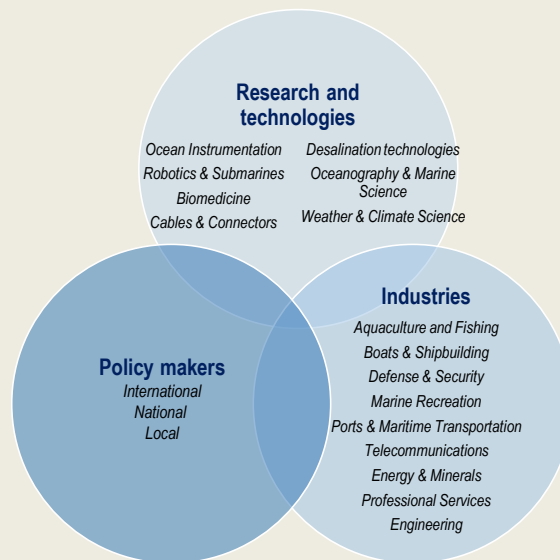
United States

Headquartered in San Diego, United States, TMA BlueTech is a non-profit industry association and cluster organiser founded in 2011 that promotes cross collaboration between academia, industry and policy makers to scale up scientific research on ocean-related activities and develop new business solutions. TMA supported the creation and expansion of ten clusters in eight different countries including France, Portugal and Spain. Through knowledge sharing, national and international outreach and networking, the members of clusters share best practices and explore new ways to collaborate with the

objective of developing new business opportunities. Clusters include members from 16 sectors that provide ocean-based solutions in the following areas:

- **Water shortage** such as exploration and conservation including submarine groundwater springs.
- **Agro-food** including underwater greenhouses that require limited energy and provide options for algae-based fertilisers.
- **Pollution** including the reuse of non-recyclable ocean plastic and transformation through pyrolysis into low-emission fuel and other products.

Figure 8. TMA Blue Tech cluster organisation



Source: Sigfusson, T. and M. Jones (2022^[56]), "Presentations at the Second Peer Learning Group (PLG) Meeting "Innovating Ocean", 3 March 2022", Founder, Iceland Ocean Cluster, Iceland, and President, TMA BlueTech, San Diego California, United States.

EU ORs could develop start-up hubs to sustain the future of the local and global ocean economy. Start-ups have the potential to create new products and services that can increase the diversification and value added of local ocean-related activities. However, to flourish, they also need access to financing across their lifetime, from developing an idea into a prototype to making their first steps into the market and scaling up and growing their business. Public policies can be crucial to bridged financing gaps, particularly in regions where start-up ecosystems are nascent, and to support relevant infrastructure, such as dedicated testing, measurement and certification facilities. In the case of the EU ORs, specific lines from cohesion policy funds could be used to match local universities' expertise with private sector needs and identify market opportunities. In 2015, H2BOAT a spin-off from the University of Genova, Italy, launched an innovative energy system for boats, that uses green hydrogen technology for autonomous leisure boats. It consists of three parts: a fuel cell, able to produce electricity from hydrogen; an accumulation with metal hydrides, able to store large quantities of hydrogen safely at low temperatures and low pressures; and an electrolyser, able to produce hydrogen from water using excess energy produced from renewable sources.

Nurturing the next generation of talents for innovative oceans

Countries and regions will need to invest in building the increasingly sophisticated capabilities that are necessary to support the mainstreaming of sustainability across ocean activities and attract investments in emerging fields. The skills needed are broad and multidisciplinary, from marine engineers and biologists to software and hardware engineers, robotics, genetics and biotechnology, to social scientists among others. Currently, the lack of skills is considered to be one of the largest constraints for the further development of the ocean economy. For example, only 5% of the 480 Education and Training (E&T) programmes currently available in 2019 in 15 EU countries directly address offshore renewable energy. In most cases, programmes address the broader framework of renewable energy with graduates who then go to work in the offshore industry (MATES Project, 2019^[57]).

International partnerships can play a key role for the EU ORs to update and expand training offers and curricula linked to the ocean economy – at all levels of education. Moreover, international partnerships can also be highly instrumental in training human resources in niche areas and advanced frontier technologies. These could take different forms within and beyond EU boundaries and through several instruments. For example, the Eastern Caribbean States Organisation is launching a virtual reality (VR) training facility for the blue economy, financed by the Korea World Bank Partnership Facility, with local academic staff training in Korea on how to develop VR technologies for fisheries in Korea. In the Netherlands, the social enterprise Sea Ranger Service with the support of public institutions aims to boost young people's interest in a maritime career by offering an overseas study programme focusing on sustainable blue activities, including aquaculture, marine restoration work and climate research.

The EU ORs – with their strong ties to Europe – can play a key role in developing training for the future of the ocean economy. The EU provides several options for fostering inter-regional and international collaboration that aims to enhance skill development through the European Maritime, Fisheries and Aquaculture Fund (EMFAF) dedicated financing and Erasmus+. These include, for example, the Ocean Literacy Coalition (EU4Ocean) that connects several organisations, including the Azores Government. This training programme contributes to ocean literacy and to the sustainable management of the ocean. Another example is the Maritime Alliance for Fostering the European Blue Economy through a Marine Technology Skilling Strategy (MATES), which aims to develop a skills strategy in shipbuilding and offshore renewable energy. Other options, such as the Blue Careers calls launched since 2016 by the European Commission, should be scaled-up as they promote co-operation between industry and education stakeholders in ocean skills development. The specificity of the Blue Careers calls resides in the possibility of building projects with partners outside the EU territory, including projects for activities involving EU ORs and neighbouring countries (European Commission, 2018^[58]).

Making the EU ORs key players in the global ocean economy

The multifaceted nature of ocean activities and of their related challenges requires working together across different regions and communities, and often across borders to maximise effectiveness and capitalise on potential synergies. This is particularly important for small countries and regions that face fiscal, market and skills constraints. While there is no unique way to collaborate, recent initiatives have focused on creating dedicated joint platforms and centres to promote joint exploration, research, and innovation. Scientific cooperation in addition to international business partnerships can play a key role in the future development of the EU ORs.

The EU ORs are working with their neighbouring countries on sustainable ocean. Thanks to their participation in several Interreg programmes, the EU ORs have increased their capacity to share and transfer knowledge and good practices with other countries. Three out of five Interreg programmes, MAC, Caribbean, and Indian Ocean, embedded specific actions related to the development of the Blue Economy

in 2014-21. However, the parties recognised that the limited absorptive capacities of the third countries involved hampered the effectiveness of cross-regional co-operation. In doing so, the EU ORs should scale up the Interreg programmes and shift their attention to more applied research projects with a clear focus and objectives, while at the same time offering other countries the opportunity to join. This the case of the Interreg Mac for 2021-27 that added four additional countries. Beyond Cabo Verde, Mauritania and Senegal also Ghana, Gambia and Côte d'Ivoire joined the group.

The EU ORs could also participate as pivotal actors in national and EU development and co-operation projects with a clear ocean focus. Concretely, the EU ORs could be involved in triangular technical co-operation involving national authorities like the Portuguese development Cooperation Agency (Camões) that, in 2022, launched a new co-operation strategy with a strong focus on the ocean. In addition, the French Development Agency (AFD) has concrete bilateral projects with Sri Lanka, India and Indonesia (AFD, 2019^[59]; Camoes, 2022^[60]). Also, multilateral co-operation supported by the European Commission could be further explored. This could be based on the experience of the Grant Scheme for Biodiversity in the EU Outermost Regions and the Overseas Countries and Territories ("BEST" Scheme), which has been included in the LIFE programme 2021-27.

5 Conclusion

The ocean economy is not only the backbone of the economic development of the EU ORs. It has the potential to transform local economies through innovation-oriented international partnerships. The EU ORs have major stakes in the future EU and the global sustainable blue economy. Their local capacities to participate in international fora and agreements in these fields should be supported. The ocean economy provides the EU with the opportunity to increase their internationalisation in a sustainable way, making them providers of solutions to global challenges and enabling them to develop tailor-made solutions to their local development needs.

The ocean economy also facilitates the internationalisation of the EU ORs and their participation in global networks beyond the EU that have a focus on science, research and development and innovation. The EU funds offer major opportunities, if managed strategically, to contribute to unleashing the potential of the ocean economy in these regions and to make these regions key players in the global ocean economy of tomorrow: one that is sustainable, innovative, and inclusive.

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