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# The blue economy

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## Overview and EU policy framework

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### IN-DEPTH ANALYSIS

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This paper focuses on the EU policy framework and the various EU initiatives and actions linked to the blue economy – encompassing all economic activities relating to oceans and seas. It provides an overview of the cross-cutting 'key enablers' and a sector-by-sector analysis.

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## Executive summary

The blue economy, encompassing all economic activities relating to oceans and seas, directly employs over 4 million people in the EU and accounts for 1.3 % of EU GDP. Established blue economy sectors, including fisheries, aquaculture, coastal tourism, maritime transport, port activities, shipbuilding and marine extraction of oil and gas, generated gross value added of €180 billion in 2017, up by 8 % compared with 2009. The landscape is evolving rapidly. The recovery of fish stocks in the north-east Atlantic has led to more sustainable fisheries, and overall, the EU fishing fleet is profitable. The traditional sectors of the shipbuilding and offshore oil and gas industries are however in decline, while the emerging offshore wind industry can be considered a well-established sector now. Other promising sectors include ocean energy and 'blue' biotechnology, while desalination is becoming more important on account of growing fresh water shortages in dry regions.

The blue growth strategy, adopted by the Commission in 2012, is the current long-term policy framework for stimulating economic activities relating to oceans and seas. Rather than introducing new legislation it focuses on a number of 'enabling' actions, such as data collection, research and innovation, maritime surveillance, funding programmes and action to improve labour skills. The collection and integration of marine data is of particular importance for developing sustainable growth and new innovative services. One example of an important EU initiative in this area is the European marine observation and data network. Furthermore, maritime spatial planning (MSP), already envisaged in the EU's integrated maritime policy, is aimed at managing our waters more coherently and at avoiding conflicts between sectors. Following the MSP Directive, Member States have to develop plans by March 2021 the latest. The marine strategy framework directive, on the other hand, is the environmental pillar of the EU's maritime policy, aimed at protecting the resources upon which economic and social activities depend by achieving good environmental status of EU's marine waters, so far with only limited progress. A network of marine protected areas, a globally recognised conservation tool, offers socio-economic benefits as well, with the EU reaching the internationally agreed target.

The blue growth strategy gives special attention to five blue economy sectors, both established and emerging, showing high potential for job creation and innovation, namely: coastal tourism, aquaculture, blue energy, blue biotechnology and seabed mining. Coastal tourism, by far the largest blue economy sector, in terms both of jobs and of value added, continues to grow but poses challenges to the environment and local communities as well. The biggest successes can be observed in the blue energy sectors, where the EU is a global leader in both offshore wind and ocean energy. On the other hand, the EU is lagging behind in aquaculture and blue biotechnology, partially as a result of administrative complexity, a lack of transparency in licensing, difficulties accessing space and water, and the high quality, health and environmental standards the EU is upholding. As regards seabed mining, in a recent resolution on ocean governance the European Parliament called for an international moratorium on commercial deep-sea mining until the effects have been studied sufficiently and all possible risks are understood. In response to the blue growth strategy, Parliament pointed out that all sectors making up the blue economy should be taken into account and drew attention to the importance of innovation for all these activities.

This paper looks into the EU policy framework and the different EU initiatives and actions taken in these areas, both by providing an overview of the cross-cutting 'key enablers' of the blue economy and by providing an analysis by blue economy sector (excluding however the sectors of coastal protection and maritime defence). Where particularly relevant, the international dimension or the position of the European Parliament is highlighted.

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# 1. Introduction

## 1.1. The concept of the blue economy

The notion of the blue economy is relatively recent, having become more widely used since the United Nations Conference on Sustainable Development (UNCSD) in Rio de Janeiro in June 2012.<sup>1</sup> However, although it has received increased attention from the public and policy-makers, interpretation of the term differs from one organisation to another. Broadly the following definitions are in use:

- a narrow definition focuses on the use of the oceans and seas for **sustainable economic development**, e.g. as in the [definition](#) used by the World Bank: '*The blue economy is sustainable use of ocean resources for economic growth, improved livelihoods and jobs, and ocean ecosystem health*'. In this definition, the blue economy can be seen as a subset of the green economy;
- another definition classifies **established maritime sectors**, whether sustainable or not, as the blue economy while classifying emerging sectors under blue growth;<sup>2</sup>
- in the widest interpretation, the term blue economy simply refers to **any economic activity relating to oceans and seas**, policy efforts are then targeted at 'greening the blue economy'.

The EU uses the [wider](#) definition, covering a broad range of established and emerging sectors. For example on energy, it includes both the traditional offshore extraction of the oil and gas sector and renewable energy sectors such as the established offshore wind industry and the emerging ocean energy industry. For the purposes of this analysis this wider definition will be used in order to cover all relevant sectors, with a special focus on what the EU is doing to support the sustainable development in the blue economy.

## 1.2. Blue growth strategy

The EU's integrated maritime policy ([IMP](#)), set up in 2007, is a framework to cover the entire maritime economy and to develop coordinated, coherent and transparent decision-making in relation to all policies affecting the oceans, seas, islands, coastal and outermost regions and maritime sectors. Within this wider scope, in 2012 the Commission launched its [blue growth strategy](#), which forms the current framework for stimulating growth in the blue economy. It was followed by an additional communication in [2014](#) and a working document in [2017](#). The strategy highlights the fact that the blue economy needs to 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](#) analysing the potential for innovation and job-creation in the blue economy and where additional effort at EU level could stimulate long-term growth and jobs in the blue economy: 'blue' energy, aquaculture, coastal and maritime tourism, 'blue' biotechnology, and marine mineral resources.

To stimulate growth in the various sectors, the strategy lists certain '**key enablers**' such as maritime spatial planning, data collection, research and innovation, maritime surveillance, and efforts to

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<sup>1</sup> J. Silver, N. Gray, L. Campbell, L. Fairbanks and R. Gruby, '[Blue Economy and Competing Discourses in International Oceans Governance](#)', *The Journal of Environment & Development*, Vol. 24(2), June 2015, pp.135-160.

<sup>2</sup> K. Johnson, G. Dalton and I. Masters, [Building Industries at Sea: 'Blue Growth' and the New Maritime Economy](#), River Publishers, 2018.

improve skills. Furthermore, regional and local partnerships are encouraged, both between Member States (e.g. around certain sea basins) but also through regional cooperation with non-EU countries and partnerships between public authorities, research institutes and economic players. In addition to policy actions, EU funding supports the development of the blue economy through various programmes.

In reaction to the [2014](#) Commission communication, Parliament adopted a [resolution](#) in 2015 on research and innovation in the blue economy to create jobs and growth, pointing out that the blue growth strategy is of limited scope and does not cover all sectors making up the blue economy, and drawing attention to the cross-cutting importance of innovation for all these activities, whether traditional or emerging.

The second chapter describes the horizontal areas in more detail, while the most important blue economy sectors, traditional and emerging, are described in Chapter 3. All EU figures mentioned in this document refer to the EU28 including the UK.

## 2. Enablers of blue growth

### 2.1. Spatial planning

Increased competition for maritime space between blue economy sectors has highlighted the need to manage our waters more coherently. These activities often cross national boundaries as well. **Maritime spatial planning (MSP)**, has therefore become a key instrument of integrated maritime policy (IMP). It allows a coherent approach to the overall planning and allocation of sea and coastal areas and aims to use the maritime space more efficiently, to prevent conflicts, to streamline decision-making, to allow a better investment climate, to increase cross-border cooperation and to protect the marine environment more effectively. In relation to the blue economy, it is important to note that MSP also highlights the potential for growth in currently unused sea areas. This is an opportunity in particular for rural areas, as MSP processes can indicate new areas where blue economy sectors can be (further) developed. MSP is not only an important tool to support emerging sectors but is about securing traditional sectors through collaboration between sectors and stakeholders and by considering cross-sectoral synergies.

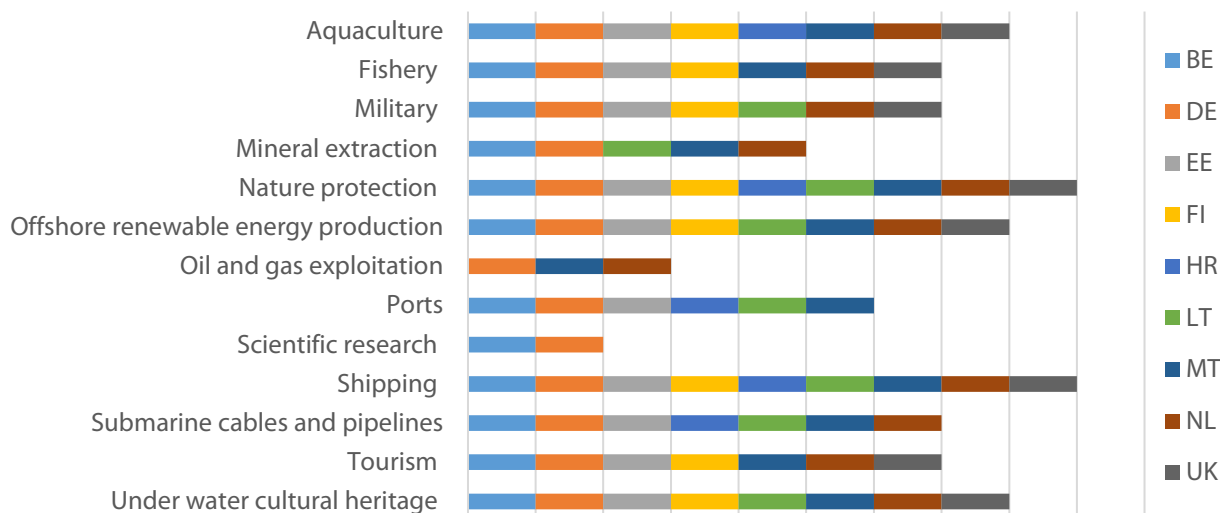
In line with the IMP, an MSP [roadmap](#) eventually led to the 2014 maritime spatial planning [directive](#). Member States needed to nominate a competent authority by September 2016 and establish plans before March 2021 (by means of public participation, the use of the best available data, and cooperation with bordering countries). The resulting plans should not only cover spatial and temporal distribution of existing and future activities in marine waters but also take into account

#### Example of a space-related conflict between sectors

A typical [conflict](#), in particular in the Baltic and the North Sea, is between **offshore wind facilities** and **fisheries**, as both sectors have similar spatial interests, e.g. specific depth ranges and proximity to the coast (especially for small-scale fisheries). Key concerns are accidental damage (e.g. damage to cables, snagging fishing gear and ship strikes) and loss of access to traditional fishing grounds (as most countries restrict fishing around wind farms for safety reasons), while studies also refer to the ecological impacts (e.g. [habitat alteration](#) and effects on [flatfish spawning grounds](#)). Harvesting fish resources in alternative locations might displace small-scale fisheries, increasing operational costs and threatening livelihoods, but also run the risk of catching vulnerable elements of the stock. Possible MSP solutions focus on **prevention** (e.g. ensuring ecological impacts are considered, acknowledging the status of fishermen in the planning process and drawing from their knowledge to create an evidence base) and **mitigation** (e.g. taking into account the fishery seasons in the construction phase, combining certain types of fisheries with wind farms, and allowing transit of fishing vessels).

land-sea interactions and be based on an ecosystem-based approach. As part of EU assistance to Member States, a [website](#) serves as an exchange platform and offers a wealth of information and expertise, including a projects and practices database, solutions for conflicts, a [handbook](#) for MSP authorities and the list of [already existing draft Member State plans](#). Figure 1 below shows the different sectors addressed in the MSP plans adopted (as of November 2018).

Figure 1 – Sectors addressed in adopted MSP plans by country



Data source: [European MSP Platform](#), version [November 2018](#).<sup>3</sup>

### International cooperation

At global level, the EU is supporting work on accelerating MSP processes worldwide, in cooperation with UNESCO's Intergovernmental Oceanographic Commission ([IOC-UNESCO](#)), as both committed to do so as part of the [conclusions](#) of the second international conference on MSP, jointly organised in Paris in March 2017. The [MSPglobal](#) initiative, [launched](#) in November 2018 as a result of this commitment, aims to promote and improve cross-border cooperation. More concretely, it will develop guidance on international transboundary planning and perform two regional pilot projects in the western Mediterranean (including cooperation between EU and non-EU countries) and the south-east Pacific.

## 2.2. Environmental status and protected areas

While oceans and seas are a primary source of food, are central to the carbon cycle, regulate the climate and produce [about half](#) of the oxygen in the air we breathe, human activities at sea and on land are disrupting the vulnerable balance of the marine environment to the extent of reducing the ecosystem services they provide. The damage caused by pollution, such as oil spills and marine litter (in particular plastics), overfishing, and climate change has serious economic consequences as well, e.g. [losses](#) in tourism and fisheries. Marine ecosystems therefore need protection, not only to conserve nature, but also to support the livelihoods that depend on them.

<sup>3</sup> Covering nine countries, each sector is only counted once by country (in case of multiple MSP plans).

### 2.2.1. Marine Directive

The Marine Strategy Framework Directive ([MSFD](#)), also sometimes shortened to the Marine Directive, was adopted in 2008 and provides a legal framework for EU action in the field of marine environmental policy. The aim is for the EU's marine and coastal waters to achieve '**good environmental status**' (GES)<sup>4</sup> by 2020. The directive requires Member States to assess the initial state of their marine waters and determine what they consider as being a GES, while also setting objectives and targets in order to achieve it by 2020 by means of national action plans.

The GES characteristics for marine waters were to be determined on the basis of 11 qualitative [descriptors](#): biodiversity is maintained; non-indigenous species do not adversely alter the ecosystem; the population of commercial fish species is healthy; elements of food webs ensure long-term abundance and reproduction; eutrophication is minimised; the sea floor integrity ensures functioning of the ecosystem; hydrographical changes do not adversely affect the ecosystem; concentrations of contaminants give no harmful effects; contaminants in seafood do not exceed safe levels; properties and quantities of marine litter do not cause harm; and energy (including underwater noise) does not adversely affect the ecosystem.

Building on previous critical assessments of the [first](#) and [second](#) phases, the [2018](#) Commission assessment stated that Member States had made **considerable efforts** to develop their national programmes by integrating existing policies and processes while also developing completely new measures – about 25 % of all measures – specifically for the purpose of the directive.<sup>5</sup> The assessment also mentions however that not all the pressures on the marine environment were covered properly and the programmes varied in their levels of ambition. Achieving GES by 2020 across all European coastal regions and for all 11 descriptors of the directive **remained therefore unlikely**.<sup>6</sup>

#### Example of a new national measure

Sweden has set up a national warning and response system in its waters. It will alert authorities immediately when a new non-indigenous species is spotted. This will trigger rapid response measures for eradication, control or any other action deemed appropriate, linked to contingency plans. The system will be connected to Sweden's monitoring programme.

While MSP could be presented as the **economic** pillar of EU maritime policy, the MSFD stands for the **environmental** pillar. However, the directives are interlinked, as the MSFD aims mainly to protect the resource upon which economic and social activities depend, while MSP focuses on environmental protection and sustainable growth.

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<sup>4</sup> Good environmental status has been defined in the MSFD as the 'environmental status of marine waters [...] which are clean, healthy and productive within their intrinsic conditions, and the use of the marine environment is at a level that is sustainable, thus safeguarding the potential for uses and activities by current and future generations'.

<sup>5</sup> Only six Member States reported their national programmes on time and appropriate infringement procedures were launched. Eventually this report covered the national programmes of 16 of the 23 maritime EU Member States.

<sup>6</sup> The [staff working document](#) accompanying the report contains further specific conclusions and recommendations per descriptor for the Member States covered by the report, while an additional [staff working document](#) was published in May 2019 covering those Member States that had not yet been assessed.



### 2.2.2. Marine protected areas

Although the primary role of marine protected areas (MPAs) is nature conservation, they generate **socio-economic** benefits in various ways. For instance by increasing the biomass of species, MPAs can help fish stocks to rebuild owing to the positive effects of MPAs spilling over to neighbouring **fisheries**. By generating clean water and rich biodiversity, MPAs can also be of benefit to marine and coastal **tourism**. A recent European Commission [study](#) looked into the economic benefits of marine protected areas and highlighted other, less obvious, examples of business benefits for sectors such as aquaculture, blue biotechnology and even passenger shipping.

#### Example of an economic benefit

The [Iroise Marine Natural Park](#), a marine protected area along the coast of Finistère (Brittany, France) is home to rich biodiversity including of dozens of species of algae. The management body of the park has supported the industry in defining sustainable harvesting techniques (which led to a bio label for near-shore seaweed harvesting in Brittany) and allowed the sustainable exploitation of algae fields within the MPA.

Another 2018 [study](#), collecting the views of 50 marine conservation experts as part of an EU-funded research project, looked at the wider value of MPAs through the broad range of **ecosystem services** they provide, from food provision to less direct benefits such as climate regulation and storm protection. Valuing the different ecosystem services, through the collection of statistics and related indicators, would allow the application of conventional cost-benefit analysis to emphasise the value and usefulness of MPAs.

#### International commitment

The EU has also been working on meeting the [commitment](#) it made under the [Convention on Biological Diversity](#) to establish [marine protected areas](#) (MPAs) in 10 % of its marine waters by 2020. MPAs are geographically defined marine areas whose primary objective is to protect vulnerable species and habitats. Impacts from human activities (such as resource extraction, fisheries or recreational activities) are therefore restricted and in some cases not even permitted. The global objective had already been reached by the end of 2016: **10.8 %** of the surface of Europe's marine waters had been designated MPAs (as compared to 5.9 % at the end of 2012, with the increase mostly owing to [Natura 2000](#) designations under the [Habitats](#) and [Birds](#) Directives). However, the target has not been reached in every sea basin. In addition, it must be noted that management, connectivity and **ecological representativeness** in the current EU network of MPAs still has to be improved, despite having met the global target.

### 2.2.3. Marine litter

Ocean pollution, and **plastic waste** in particular, has been receiving more attention in recent years. Marine litter poses a major threat to the marine environment and its impacts include entanglement and ingestion by animals, habitat degradation and exposure to certain chemicals. Marine litter also has socio-economic impacts. A 2014 [study](#) for the European Commission estimates that degradation as a result of marine litter costs the EU economy between €259 million and €695 million per year, affecting mainly the tourism and recreation sector (up to €630 million) and the fisheries sector (up to €62 million).

Most of the plastic in the oceans originates from land-based sources. On European beaches, it has been estimated by the Commission that single-use plastics account for about half of all marine litter by item counted. A new directive ([2019/904](#)) on the reduction of the impact of certain plastic products on the environment, the 'Single-use Plastics Directive', seeks to address in particular the top 10 single-use plastics and discarded fishing gear found on European beaches. It builds on the

[2015 circular economy action plan](#), and on the 2018 [strategy for plastics in a circular economy](#) and introduces measures such as bans and requirements relating to consumption reduction, product design, labelling and awareness-raising and additional extended producer responsibility requirements. The Parliament overwhelmingly supported the directive.<sup>7</sup>

While in most sea areas, the majority of sources of marine litter are land-based, ships account for about [20 %](#) of global discharges into the sea. The EU has therefore adapted its rules with the Port Reception Facilities Directive ([2019/883](#)), requiring ports to collect all sorts of **ship waste**, to structure the relevant fees in a way that does not incite ships to discharge at sea or dump waste into the sea, and also to check what waste they have delivered. Fishing vessels will also be encouraged to bring **passively fished waste** to the port, in principle without having to pay any extra charges for it. The directive is a clear example of how the EU is striving to strike a balance between environmental protection and economic activities.

Both directives were adopted by the co-legislators in 2019, before the European elections, and Member States have two years (by mid 2021) to implement the new rules in their national legislation.

## 2.3. Research, data and skills

### 2.3.1. Research and innovation

Financial contributions from the EU account for only a limited amount of public research funding, the greater part being spent through national and regional programmes. Nevertheless, EU funding and policy-making exerts significant leverage, and can help to promote and reach a critical mass to address major cross-thematic marine research challenges. In 2008, the European Commission launched its [strategy for marine and maritime research](#), within the framework of the IMP, in order to address the complexity of marine and maritime issues, through **capacity-building** (e.g. through new infrastructure and promotion of research skills), **better integration** across research disciplines and the creation of **synergies** between Member States, regions and industrial sectors. The major topics listed in the strategy as needing an integrated approach, are the impacts of climate change and human activities, an ecosystem approach to resource management and spatial planning, marine biodiversity and biotechnology, continental margins and deep sea, operational oceanography and marine technology, and renewable energy.

Since the launch of the strategy, many research projects on the marine environment have received funding through EU research programmes. These include dedicated initiatives, such as the [ocean of tomorrow](#) calls under the seventh framework programme for research (**FP7**, 2007-2013), which has funded 31 projects for a total EU contribution of nearly €195 million.<sup>8</sup> The ocean of tomorrow approach has been continued under **Horizon 2020**, the current EU research programme (2014-2020), through the **blue growth** calls. More than 53 projects have already been selected for a total EU contribution of more than €338 million. Further opportunities for marine research can be found in related areas across the Horizon 2020 programme (such as food security, energy, transport, materials, information technology and research infrastructure).

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<sup>7</sup> The European Parliament [adopted](#) the agreement with EU ministers in plenary by 560 votes to 35, with 28 abstentions.

<sup>8</sup> In addition to these dedicated calls for research projects, many other related marine and maritime research actions take place under various other FP7 thematic priorities and specific programmes.

With the support of the EU, successful initiatives have been launched to foster **marine research cooperation** in regional sea basins, such as the Baltic ([BONUS](#)) and the Mediterranean ([Blumed](#)). More particularly the aim is to coordinate all marine and maritime research and innovation activities, consolidating networks, fostering integration of knowledge and connecting the research community, policy makers, private sector and civil society. In May 2019, the European Union launched an equivalent [initiative](#) for the Black Sea basin, while an ongoing Horizon 2020 [project](#), coordinated by BONUS, aims to [create](#) a joint Baltic and North Sea research and innovation programme. On a wider geographical scope, the Atlantic Ocean Research Alliance ([AORA](#)) is a similar cooperation initiative between the EU, Canada and the United States, set up following the [Galway Statement](#) on Atlantic Ocean Cooperation in May 2013. The 2017 [Belém Statement](#) meanwhile transforms the previously bilateral scientific cooperation between the EU and Brazil and South Africa into a South Atlantic cooperation framework and should also help to link research activities in the South Atlantic and Southern Ocean with those in the North Atlantic.

#### Example of a blue growth research project

The Horizon 2020 project 'Climate change and European aquatic resources' ([CERES](#), 2016-2020), with a total EU contribution of €5.6 million to 26 participating research organisations, reveals and explores how climate change is affecting different European fish/shellfish species – for example, plaice have gone from waters 20 to 30 metres deep down to 50 metres – and develops tools and solutions to help fishermen and fish farmers to adapt.

Funded via the Horizon programme, the European Institute of Innovation and Technology ([EIT](#)), an independent EU body created in 2008, has a mission to boost sustainable economic growth and competitiveness by reinforcing the innovation capacity of the Member States and the Union. The EIT operates through its knowledge and innovation communities (KICs): large-scale integrated European partnerships, bringing together research organisations, educational institutions, businesses and other innovation stakeholders such as public authorities or NGOs. For the next programming period, the EIT envisages the creation of a new '**water, marine and maritime**' KIC. The [staff working document](#) accompanying the new EIT regulation identified the sector as an area with a strong research base, high market potential and newly emerging innovative sectors, but at the same time lacking engineering and entrepreneurship skills, showing a fragmentation of efforts and a disconnection between education, research, and innovation activities as well as an under-developed knowledge base. If approved, the new KIC would start to fund innovative projects by combining sectoral and cross-sectoral innovation and bringing together people from different sectors, backgrounds and disciplines who would otherwise not necessarily meet.

The research framework programmes are complemented with action through other European funds. For instance the [Blue Labs initiative](#), funded via the European Maritime and Fisheries Fund (EMFF), builds on projects supported by Horizon 2020 and supports teams in which researchers, industry and local stakeholders work together to take research and innovation results out of the lab and onto the commercial stage.

### 2.3.2. Knowledge and data collection

The collection and integration of **marine data** is an important element of the blue economy. It can stimulate innovation, lead to the development of new services and reduce uncertainty about the

state of the seas and oceans. Three major EU initiatives in this domain form part of the marine knowledge 2020 strategy.<sup>9</sup>

Under the new data collection framework (DCF), first adopted in 2000 and last revised in 2017,<sup>10</sup> Member States need to collect, manage and make available a wide range of fisheries and aquaculture data that is needed to support the EU in the provision of the 'best available scientific advice'. It includes biological data, statistics on fishing activities and economic and social data, which are compiled by the Joint Research Centre (JRC). The data is analysed by the Scientific, Technical and Economic Committee for Fisheries (STECF) an advisory body of scientific experts providing scientific advice relating to the implementation of the common fisheries policy (CFP). National data collection efforts are co-funded through the EMFF, and the resulting STECF [reports](#) (including evaluation of the data collected and its quality) are publicly available. The DCF regulation stipulates that by 11 July 2020, the Commission must submit to the European Parliament and to the Council a report on the implementation and functioning of this regulation.

[Copernicus](#), the EU's satellite earth observation programme, includes a [marine environment monitoring service](#), providing information on the physical state and dynamics of the ocean and marine ecosystems. It covers data on currents, winds and sea ice to improve ship routing services, monitors water quality and pollution, plays a role in weather forecasting and climate change monitoring and enables [fisheries controls](#) via satellite. It currently [offers](#) over 170 open data ocean products, available for download or to be explored using the online visualisation tool.

Traditionally, the various sorts of marine data have been collected in a fragmented way and most data collection efforts, by both private and public organisations, have focused on meeting the needs of a single purpose. Easy access to reliable and accurate information is however crucial in order to address environmental threats and to stimulate sustainable economic development. This is the purposes of the European marine observation and data network (EMODnet), which collects, processes and makes freely available all sorts of marine data. The project, initiated in [2009](#), has now reached an operational stage involving more than 150 organisations and covering seven sub-portals: [bathymetry](#), [geology](#), [physics](#), [chemistry](#), [biology](#), [seabed habitats](#) and [human activities](#). One well-known product is the [European atlas of the seas](#), where users, in particular schools, researchers and professionals, can benefit from more than 200 map layers, spanning these seven disciplinary themes, and explore, collate and create their own marine and coastal maps. Efforts are now focused on maximising use of the atlas by completing the multi-resolution maps of Europe's marine waters in 2020.

### International Council for the Exploration of the Sea (ICES)

[ICES](#) is an intergovernmental marine science organisation connecting more than 5 000 scientists from over 700 marine institutes in [20 member countries](#). Its area of research covers mainly the North Atlantic Ocean, including the adjacent Baltic Sea and North Sea, but also extends into the Arctic, the Mediterranean Sea, the Black Sea, and the North Pacific Ocean. Based on scientific work and the collection of marine data, ICES provides scientific advice for a wide range of recipients, including the European Commission. To this end ICES manages a well-established data centre and also publishes its [data](#) and [reports](#) so it can contribute to an increased understanding of the marine environment.

<sup>9</sup> See also the [2010](#) communication, the [2012](#) green paper and a [2014](#) staff working document.

<sup>10</sup> As a recast of the 2008 regulation, introducing modifications to simplify and align it with the reformed CFP.

### 2.3.3. Blue economy skills and ocean literacy

In order to achieve blue growth, qualified and skilled professionals are needed. However, many sectors are experiencing difficulties in finding the right employees, owing to the need for a generational renewal (e.g. in fisheries) and / or to the development of highly innovative technologies in recent years, leading to an even higher demand for specialised workers (e.g. in aquaculture, shipbuilding and marine biotechnology). To address these skills gaps, the EU has been taking action through a variety of initiatives.

Within the [2016 new skills agenda for Europe](#), the '[blueprint for sectoral skills cooperation](#)' brings stakeholders (such as businesses, trade unions, research and training institutions and public authorities) together in sector-specific partnerships, also called 'sectoral skills alliances', to develop a comprehensive skills strategy. Concrete actions include the development of new or updated vocational education and training. Maritime technology (in particular offshore renewable energy and shipbuilding) has been selected as one of the first five pilot sectors and the alliance started with the project '[MATES](#)' in [2018](#). Maritime shipping was one of the four sectors in the next wave and the corresponding project [SKILLSEA](#) kicked off in February 2019. Both projects are receiving EU funding through Erasmus+.

#### Example of a 'blue careers' project

The Dutch project [Cooperation in education and training for blue careers](#) (2017-2018) received a €0.5 million EU contribution to recruit and train lecturers, who devote part of their time to training new employees, as part of their jobs in the maritime cluster, and to setting up an apprenticeship desk for young students looking for a future career in the maritime sector.

The Executive Agency for Small and Medium-sized Enterprises ([EASME](#)), launched a series of EMFF calls for proposals to fund projects in the field of skills' development for the blue economy (in [2016](#), [2017](#) and [2018](#) representing together a total allocated budget of €12.4 million).<sup>11</sup>

An [expert group on skills and career development in the blue economy](#) was set up in 2017 to advise the Commission on education, training, skills and career development within the blue economy. The 40 experts selected cover different sectors and sea basins and with their support the Commission has published three compendiums describing good practices and innovative approaches to tackle skills issues: namely on [industry-education cooperation](#), [life-long learning, mobility and training programs](#) and [ocean literacy](#).

Furthermore, two Horizon 2020 funded projects were aimed at enhancing ocean literacy among European citizens and selected target groups: [Sea Change](#) (with an EU contribution of €3.4 million and completed in February 2018) and [ResponSEAble](#) (with an EU contribution of €3.7 million and completed in March 2019). One example of output from ResponSEAble was the '[Keep the Baltic Blue](#)' (social media) campaign, which was accompanied by more detailed [information](#) explaining the link between eutrophication and agriculture in the Baltic Sea.

<sup>11</sup> In 2016, a dedicated 'blue careers in Europe' call for proposals was launched. In 2017 and 2018 it concerned subtopics of the blue economy calls: respectively 'Strand 3 - Blue networks in the Mediterranean' and 'Topic 2 - Blue careers'.

## 2.4. Funds and investment

The blue growth strategy mentions EU funds and EU-funded investments as a way to reinforce policy efforts to unlock the potential of the blue economy, especially for the sectors that are the most innovative but where investment is insufficient.

The fund most directly related to oceans and seas, is the **European Maritime and Fisheries Fund** (EMFF). The EMFF is also the smallest of the five European structural and investment funds ([ESIFs](#)) that support EU economic development up to 2020. The budget of the current [EMFF](#) (2014-2020) amounts to about €6.4 billion, of which 90 % is spent under shared management. As in the case of the other ESIFs, the co-financed actions under shared management are specified in the operational programmes prepared by the Member States and approved by the European Commission. The bulk of the EMFF is earmarked for supporting the fisheries and aquaculture sectors and the implementation of the common fisheries policy (CFP), but it also supports the blue economy in a wider sense through [community-led local development](#) and through various calls for proposals under direct management (e.g. the examples of the Blue Labs initiative and skills development in previous chapters). About €72 million (1.2 %) is dedicated to the implementation of the IMP, which finances actions such as developing integrated maritime governance, promoting cross-sectoral cooperation, contributing to maritime spatial planning and supporting marine observation systems. The [EMFF](#) regulation for the next period (2021-2027) is currently being negotiated. The budget in the legislative proposal amounts to €6.14 billion in current prices, representing stable funding compared with the current MFF excluding the UK. However, in terms of constant prices, countering the effect of inflation, it represents a decrease of around 13 %. Parliament on the other hand is [proposing](#) to increase the financial envelope by 10 % in view of the many challenges in the fisheries sector as well as the broader scope to be covered (including increased support for aquaculture and the blue economy).

In addition to the EMFF, various other Union funds contribute to the blue economy. These include the **Horizon 2020** fund as mentioned under 'Research and Innovation' above, but also the other ESIF funds, for example, the largest of them, the **European Regional Development Fund** ([ERDF](#)).<sup>12</sup> Regional authorities can support ERDF programmes and projects in local blue economy sectors such as coastal tourism, maritime transport, and aquaculture, etc. According to the 2017 [staff working document](#) on the blue growth strategy, about €5.5 billion (out of the total ERDF budget of €199 billion for 2014 to 2020) was allocated to the blue economy. Similarly other ESIFs such as the **European Social Fund** (ESF) and the **Cohesion Fund** (CF) support the blue economy. For example, ESF projects in coastal regions boost training and education in the marine and maritime sectors.

Other sources of EU funding that cover projects relating to the blue economy include the [LIFE](#) programme for environment and climate action, the [COSME](#) programme for competitiveness of enterprises and SMEs and the Connecting Europe Facility ([CEF](#)).

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<sup>12</sup> The ERDF aims to strengthen economic and social cohesion in the EU and also includes [Interreg](#), supporting cooperation across borders.

In addition to public funding, there is a need for financing from the private sector where large-scale investments are needed in capital-intensive sectors such as ocean energy, coastal protection and infrastructure works in seaports. The European Investment Bank (EIB) has been heavily involved in financing blue economy sectors (e.g. in rehabilitating seaport infrastructure and developing the off-shore wind industry), more recently via the European fund for strategic investments (EFSI).<sup>13</sup> However, the blue economy still has [low levels of investment](#) due to the high risks and longer-term paybacks for private investors. A recent [study](#) (February 2019) commissioned by the European Commission recommends the creation of a blue economy investment platform, taking into account the varying blue economy sectoral needs, in order to ensure that funds reach the innovative, young businesses contributing to sustainable economic sectors.

#### Example of a LIFE+ project relating to the blue economy

The LIFE+ European project [AGESCIC](#) (2018-2021, €2.2 million EU contribution), led by a French public enterprise, is aimed at reducing the underwater noise and turbidity impacts of coastal works on marine fauna and ecosystems and is therefore contributing to achieving GES as required by the MSFD. The project combines [three innovative technologies](#) to provide a cost effective solution for the environmental challenges caused by coastal works.

#### Sustainable blue economy finance principles

There is global growing recognition that investments in blue growth should incorporate sustainability elements. As a way to further implement, promote and achieve the UN [Sustainable Development Goal 14](#) 'to conserve and sustainably use the oceans, seas and marine resources', the European Commission, the [World Wildlife Fund](#), the [World Resources Institute](#), and the European Investment Bank developed a set of voluntary [Sustainable Blue Economy Finance Principles](#), which have been endorsed by a number of other international finance investors and initiatives, [including UNEP's Principles for Sustainable Insurance Initiative \(PSI\)](#).

## 2.5. Maritime surveillance and security

Blue growth also needs a safe and secure environment. As part of the EU's IMP, [integrated maritime surveillance](#) aims to provide authorities involved in the different aspects of surveillance, i.e. border control, safety and security, fisheries control, customs, environment or defence, with ways to exchange information and data. The basic principles underpinning the integration of maritime surveillance were set out in 2009, and a 2010 [communication](#) outlined the roadmap towards a European digital system for maritime information sharing.

#### Maritime security strategy

The European Union maritime security strategy (EUMMS), first adopted by the Council in [2014](#), is concerned with maintaining the rule of law in maritime sectors, including areas beyond national jurisdiction. It covers, for instance, the safety of maritime assets such as ports and offshore installations and protection against piracy in maritime transport. The EUMMS operates under the maritime security action plan, which was last revised in [2018](#). New elements include regional approaches to security threats in maritime zones of great strategic interest (e.g. the Gulf of Guinea and the Horn of Africa).

As a result, a **common information-sharing environment** (CISE) is currently being developed jointly by the European Commission and EU/EEA Member States. It integrates existing surveillance

<sup>13</sup> The EFSI is managed by the EIB and is one of the three pillars of the [investment plan for Europe](#) (also referred to as the 'Juncker plan').

systems and networks and gives all authorities concerned from different sectors access to the information they need for their missions at sea. A pre-operational phase, funded via the [EUCISE2020](#) research project, was concluded in March 2019 and the project has now [entered](#) its transitional stage towards an operational system, funded by the EMFF and [managed](#) by the European Maritime Safety Agency ([EMSA](#)).

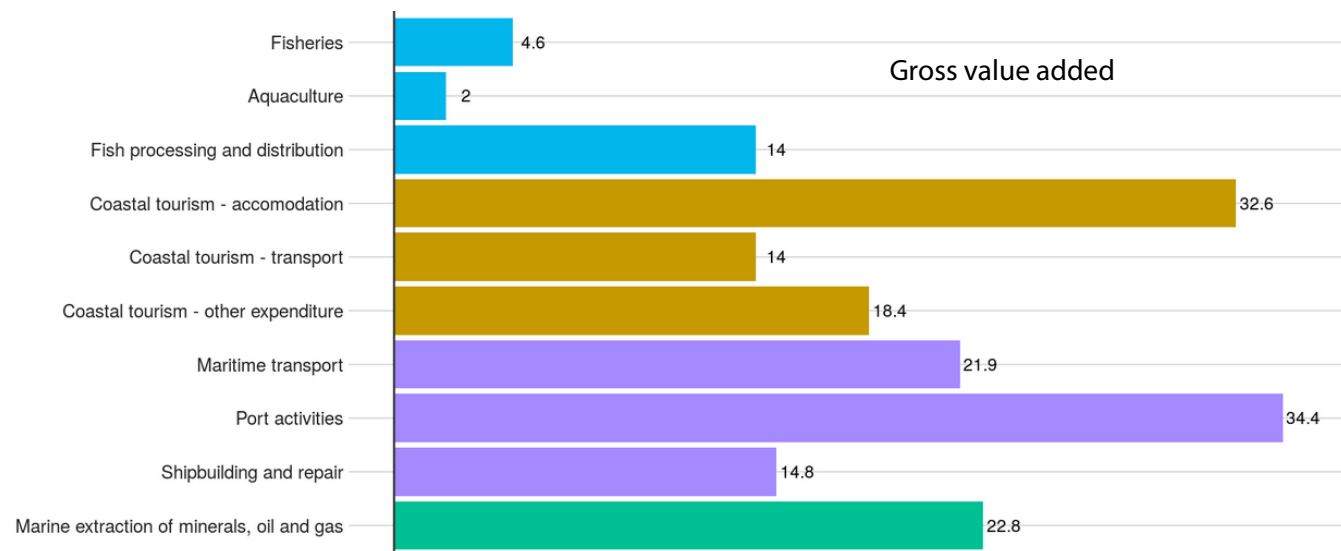
### 3. Blue economy sectors

According to the [2019 blue economy report](#) from the European Commission, established blue economy sectors include 'marine living resources' (i.e. fisheries, aquaculture and fish processing and distribution), 'coastal tourism', 'maritime transport, port activities, shipbuilding and repair' and 'marine extraction of oil, gas and minerals' (excluding seabed mining). In 2017 the established sectors directly employed over **4 million** people (up by 7.2 % compared to 2009) and accounted for a gross value added (GVA) of **€180 billion** (up by 8% compared to 2009). As regards the contribution to the overall EU economy, these figures represented respectively **1.8 %** of total EU employment and **1.3 %** of EU GDP.

Other blue economy sectors selected to be covered in this chapter for their emerging and/or innovative potential are offshore wind and ocean energy, blue biotechnology, seabed mining and desalination.<sup>14</sup>

The charts in Figure 2 show, first, the GVA for the established blue economy sectors and, second, the distribution of employment by sector (including emerging and innovative sectors).<sup>15</sup> The sector figures cited in the following chapters are derived from the 2019 blue economy report, unless otherwise indicated.

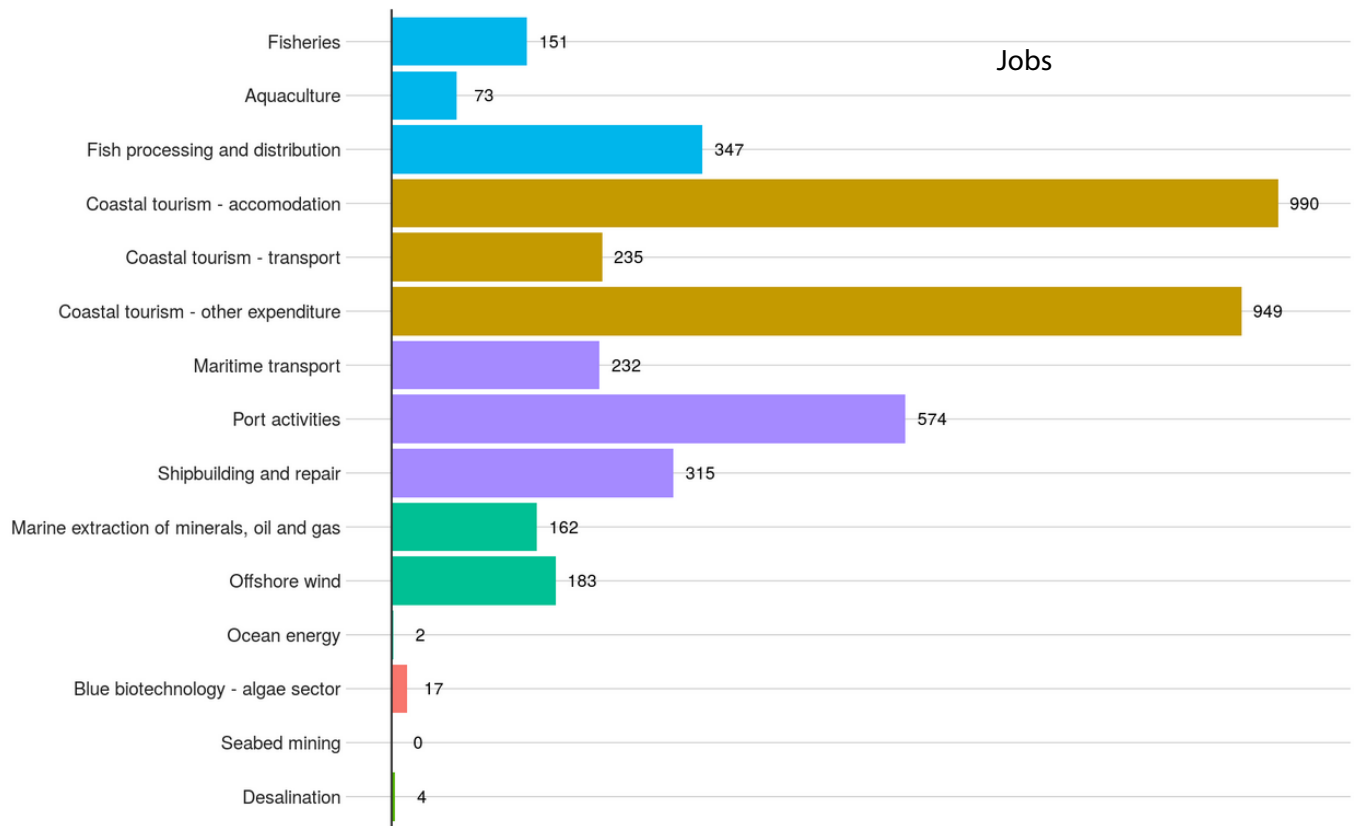
Figure 2 – Gross value added (in billion euro, established sectors only) and the number of people employed (thousands) by EU blue economy sector (2017 data)



<sup>14</sup> Some specific (mostly public) sectors, for instance maritime defence, coastal protection and underwater cultural heritage are not included.

<sup>15</sup> 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. As for seabed mining, no commercial EU exploitation exists, only a limited number of jobs in research and development.





Data source: The [EU blue economy report 2019](#) by the European Commission.

## 3.1. Fisheries, aquaculture and processing

Global seafood consumption has more than doubled in the past 50 years and has outpaced population growth (3.2 % v 1.6 %). The EU is the largest seafood market in the world. On average, the per capita consumption in the EU reached over 24 kg of seafood in 2016, of which the vast majority comes from wild catches while farmed seafood accounts for about one quarter of consumption. As the largest importer of seafood, the EU's self-sufficiency in meeting growing demand for fishery and aquaculture products from its own waters is 45 %.<sup>16</sup>

### 3.1.1. Fisheries

Fishing is one of the oldest blue economy sectors, together with shipping. It has a centuries-long history of using maritime space, but small-scale fisheries in particular can be vulnerable to competition from newer users. Fishing has a relatively low economic weight in comparison with other maritime activities, with a GVA of **€4.6 billion** in 2017, i.e. **2.6 %** of the total GVA for established blue economy sectors. However, it is highly significant in terms of the development of coastal communities, where long-lasting fishing activities have influenced local culture and traditions, as well as fish consumption patterns.

According to the annual economic report on the EU fishing fleet [STECF 19-06](#), **151 981** fishermen were directly employed in EU fishing in 2017, corresponding to 107 807 full time equivalents (FTE). The small-scale fleet employed 76 801 fishermen (51 % of the total), whereas 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](#) on average by 1.3 % per year, partly on account of fleet capacity reduction. However, at regional level, employment has increased in a number of fleets in the North Sea and Atlantic, as opposed to other regions. The EU average annual FTE wage has increased by 2.7 % per year, reaching €28 652 in 2017.

EU marine fisheries production reached almost 5.3 million tonnes 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 UK (13.6 %) and, Italy (12 %). Three-quarters of all EU catches were taken in the North East Atlantic. Atlantic mackerel was the top species landed in value, followed by European hake, yellowfin tuna, Norway lobster and Atlantic herring.

Overall, fishing is a profitable activity in the EU, registering a net profit of **€1.3 billion** in 2017. Profits have risen over the last few years, mainly as a result of higher average fish prices and continued low fuel prices, while improved status of some important stocks and technological advances have also contributed. However, there are strong variations by fleet segment and sea basin. Losses at Member State level were recorded for Finland, Germany, Malta and Lithuania. In December 2018, the EU fleet register numbered **81 644** vessels, with an overall capacity of 1 533 180 in gross tonnage (GT) and 6 075 634 in kilowatts (kW). In the last few decades, the EU fishing fleet capacity has declined in terms of both tonnage and engine power, a decrease that has continued in recent years, albeit at a lower rate. Nevertheless, a significant number of fleet [segments](#) (190 of the 255 assessed) continue not to be in balance with their fishing opportunities. The economic performance of the fishing sector is expected to continue to improve as fish stocks recover and capacity continues to adapt, although the positive trend could be offset by increasing fuel prices.

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<sup>16</sup> Referring to total EU fisheries and aquaculture production over total apparent EU consumption (with total apparent consumption calculated as total EU production plus import volume and minus export volume).

In the EU, the **common fisheries policy (CFP)**, launched in 1983 and reformed most recently in 2013, is designed to secure sustainability in EU fisheries, including the environmental, economic and social dimensions. The CFP applies to the management of fisheries within EU waters, but also to international EU fisheries relations, including bilateral fisheries agreements with third countries. The EU has **exclusive competence** as regards the conservation of its marine living resources, which is a core part of the CFP. With its reform in 2013, the CFP has set ambitious targets in this respect. The current framework aims to achieve exploitation of all stocks at sustainable levels by 2020, to implement multiannual plans defining the framework or long-term management of stocks by fishery and sea basin<sup>17</sup>, and to implement a discard ban through a landing obligation for all catches that has applied in all EU waters since 1 January 2019.<sup>18</sup>

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

Implementation of the reform will continue, in particular to develop new multiannual plans, and to effectively control and enforce the landing obligation. The revision of the fisheries control system, launched in [May 2018](#), is intended to improve efficiency and ensure compliance with the current CFP rules. The fight against illegal, unreported and unregulated (IUU) fishing within and beyond EU waters also presents major challenges. The IUU Regulation [1005/2008](#) is considered a key example of an EU-led initiative to promote sustainable fisheries around the globe, and offers opportunities to improve environmental and socio-economic standards on a global scale by restricting access of IUU-caught products to the EU market and thus levelling the playing field between producers.

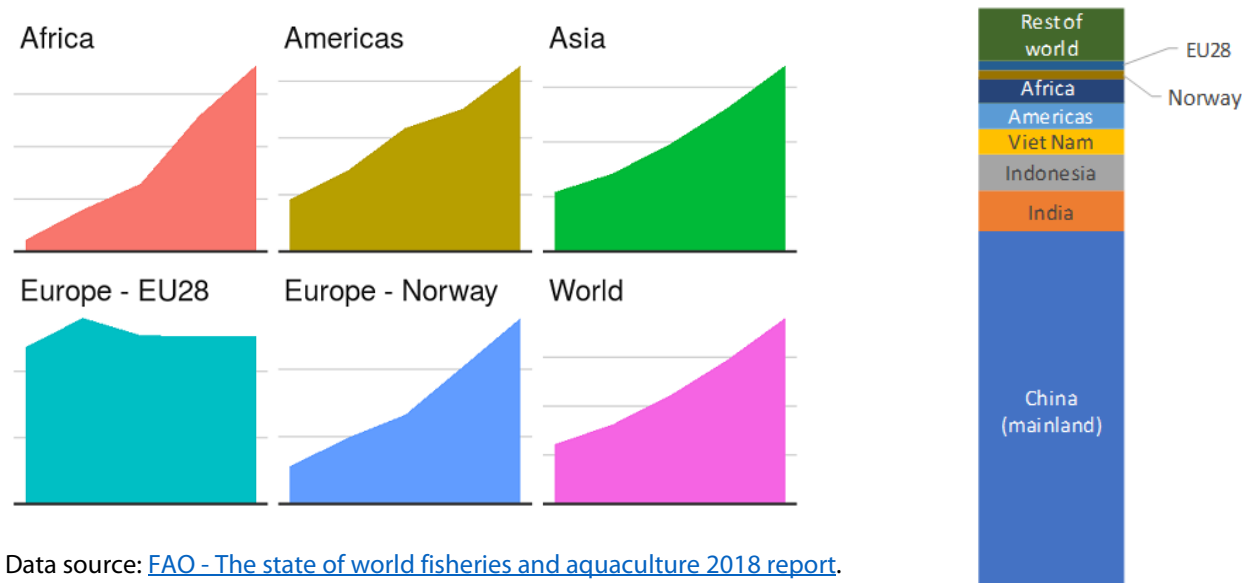
### 3.1.2. Aquaculture

Aquaculture refers to the farming of fish, shellfish, algae and other aquatic organisms and takes place both in inland and marine waters. The increase in demand for seafood and a fisheries sector whose potential for expansion depends on the sustainable exploitation of resources have made aquaculture a fast-growing economic sector around the world. According to latest two-yearly [FAO report](#), worldwide aquaculture food fish production has **more than tripled** over two decades: from about 24 million tonnes to more than 76 million tonnes in 2015, reaching almost the same volume as in fisheries. EU aquaculture production however remained more or less stable during the same period, with a production volume of about **1.3 million** tonnes, representing only 1.6 % of global food fish production in 2016, just below the production level of Norway (most of the world volume, almost 90 %, is produced in Asia). Figure 3 shows the individual trendline for each major region on the left-hand side, while showing the breakdown of major producers as a proportion of total world production on the right-hand side.

<sup>17</sup> There are now four multiannual plans in force, covering the Baltic Sea, the North Sea, the Western Waters and the western Mediterranean. A multiannual plan for the Adriatic Sea has been proposed by the Commission.

<sup>18</sup> The landing obligation requires all catches to be landed and counted against quotas to eliminate the wasteful practice of discarding undesired catch. It applies to all species subject to catch limits and, in the Mediterranean, to all species subject to minimum conservation reference size.

Figure 3 – Trendline of aquaculture growth by region (1995-2015) and size of major producers as a proportion of worldwide production (2016)



Data source: [FAO - The state of world fisheries and aquaculture 2018 report](#).

According to [2016](#) figures, about **75 000** people from around **12 500** businesses are directly employed in aquaculture in the EU. Production is mainly concentrated in five countries, representing about three quarters of the sales volume in 2016: Spain (21 %), France (15 %), Italy (14 %), the United Kingdom (14 %), and Greece (10 %). Out of the three sub-sectors (marine, shellfish and freshwater), marine aquaculture has the lowest employment (13 %) but is the largest economic sector in terms of sales value (51 %). The most important marine fish species in aquaculture in the EU28 is salmon (of which more than 91 % of is farmed in the United Kingdom) and seabream and seabass (with Greece as the main producer).<sup>19</sup> The shellfish sector on the other hand is the most important in terms of jobs (representing half of the employees, mostly working in micro-enterprises) with Spain and France as the main producers.<sup>20</sup> The most important species in freshwater aquaculture are trout (with Italy, Denmark and France as leading producers) and carp (produced mainly in central Europe).<sup>21</sup>

Aquaculture is covered by the CFP, with shared competence between the EU and its Member States, and receives financial support through the EMFF. As it can address the growing gap between the level of seafood consumption and the volume of captures from fisheries in the EU, it was identified as one of the five focus areas in the blue growth strategy. Strategic [guidelines](#) around four priority areas – simplifying administrative procedures, improving access to space and water, increasing competitiveness and exploiting competitive advantages due to high standards – guided the [multiannual national plans](#) that are now being implemented. While increases in production should begin to take effect as a result of the actions in the national plans, the Scientific, Technical and Economic Committee for Fisheries ([STECF](#)) points out there is no clear link between actions and production patterns and the projected quantities appear to be too optimistic in many cases. Nevertheless, it considers the plans to be a step forward and an example of success in shepherding the different stakeholders towards a common goal and strategy. In addition, the creation of the

<sup>19</sup> Greece represents 60 % of the sales volume, followed by Spain (25 %) and Italy (7 %).

<sup>20</sup> The main species in terms of weight are mussels (79 %) and Pacific cupped oyster (12 %).

<sup>21</sup> With Poland, the Czech Republic and Hungary as the main producers.

aquaculture advisory council ([AAC](#)) enables the EU and Member States to benefit from the knowledge and experience of industry representatives and other stakeholders.

Parliament adopted an own initiative [report](#) in May 2018 in which it stressed, not least, the continued relevance of the priority areas in the [strategic guidelines](#) – namely: administrative complexity, a lack of transparency in licensing, and spatial planning difficulties – and called for reinforced EU action, including EU-level objectives, while also setting regionalised objectives adapted to the particularities of each branch of aquaculture at local level. It also supported the [recommendations](#) of the 'Food from the oceans' report, in particular the need to bring the development of marine aquaculture to a higher and more strategic level, by means of a complete and coordinated political strategy. Parliament also stressed the insufficiently explored opportunities that freshwater aquaculture could offer developing rural areas, including the potentially important social and environmental roles it could play, going far beyond its economic value.

Under the [next EMFF](#) for the 2021-2027 period, aquaculture has received increased attention, both in the Commission proposal and in the Parliament<sup>22</sup> and Council positions. Areas eligible for support would include innovation, productive investments, compensatory measures providing critical land and nature management services, and animal health and welfare measures.

### 3.1.3. Processing

The data collection framework regulation refers to the processing sector as enterprises whose main activities are the 'processing and preservation of fish and fish products'. This includes the preparation and preservation (freezing, drying, cooking, smoking, salting, canning, etc.) and the production (fish fillets, caviar, etc.) of fish, crustacean and mollusc products.<sup>23</sup> According to the figures for [2015](#), the sector employs about **126 000** workers from around **3 800** businesses in the EU, mostly in coastal areas, and generates a gross added value of **€6.1 billion**.<sup>24</sup> 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. Accurate [statistics](#) are not available, but it is estimated that more than half are women (up to 67 % in Portugal and up to 90 % in some local coastal areas),<sup>25</sup> as compared with about 13 % for fisheries and 25 % for aquaculture.

Fish products and products of first stage processing were already covered in the Treaty of Rome as part of the common agricultural policy. Ever since, investments in the processing of fishery and aquaculture products have received structural support. Under the current EMFF, 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 organisations<sup>26</sup> and for the preparation and implementation of their production and marketing plans.

<sup>22</sup> In its [first-reading position](#), adopted under the previous term on 4 April 2019, Parliament highlights the increased focus on aquaculture by devoting a specific chapter to the sector within the regulation and by renaming the fund the European Maritime, Fisheries and Aquaculture Fund (EMFAF).

<sup>23</sup> Namely [Nace Code](#) 10.20. This includes the production of prepared fish dishes for human consumption or fish-meal for animal feed but does not include the manufacture of prepared frozen fish dishes or fish soups.

<sup>24</sup> In contrast to the Commission's blue economy report, this covers only the processing and not the distribution sector.

<sup>25</sup> Available [data](#) collected from [fisheries local action groups](#) show that women represent 75 % of the processing workforce in [Costa da Morte](#) and 90 % in [Plodovi Mora](#) in Croatia.

<sup>26</sup> 'Inter-branch organisations' also sometimes represent the processing activity, alongside fisheries and aquaculture. Rules regarding inter-branch and producer organisations are covered by the [common market regulation for fishery and aquaculture products](#).

As there is growing demand for seafood, but a stagnating supply of raw materials from the EU's primary sector (i.e. fisheries and aquaculture), the processing sector is increasingly dependent on imports. Rising costs of raw materials and energy are among the main causes of the sector's low profit margins. On the other hand, there is growing demand for certified products on the consumer side, covering both raw materials and certification of the processing, which can further increase prices but also offers economic benefits.

## 3.2. Coastal and maritime tourism

As part of the EU's blue growth strategy, the coastal and maritime tourism sector has been identified as an area with special potential to foster a smart, sustainable and inclusive Europe. Employing more than **2.2 million** people, the sector is by far the biggest employer in the blue economy (accounting for **54 %** of jobs in the established blue economy sectors).

According to one study, maritime tourism covers: 'tourism that is largely water-based rather than land-based (e.g. boating, yachting, cruising, nautical sports), but includes the operation of landside facilities, manufacturing of equipment, and services necessary for this segment of tourism'. On the other hand, coastal tourism covers: 'beach-based recreation and tourism (e.g. swimming, surfing, sun bathing), and non-beach related land-based tourism in the coastal area (all other tourism and recreational activities that take place in the coastal area for which the proximity of the sea is a condition), as well as the supplies and manufacturing industries associated to these activities'.<sup>27</sup>

Coastal and maritime tourism plays a significant role in the economic development of coastal regions. According to Eurostat, in 2017, coastal areas accounted for 45.7 % of the total nights spent in EU-28 tourist accommodation.<sup>28</sup> However, according to the same source, the inclination of holidaymakers to visit coastal areas was generally higher in southern EU Member States. Figure 4 shows the number of nights spent in tourist accommodation by residents and international tourists in EU NUTS2 level regions.

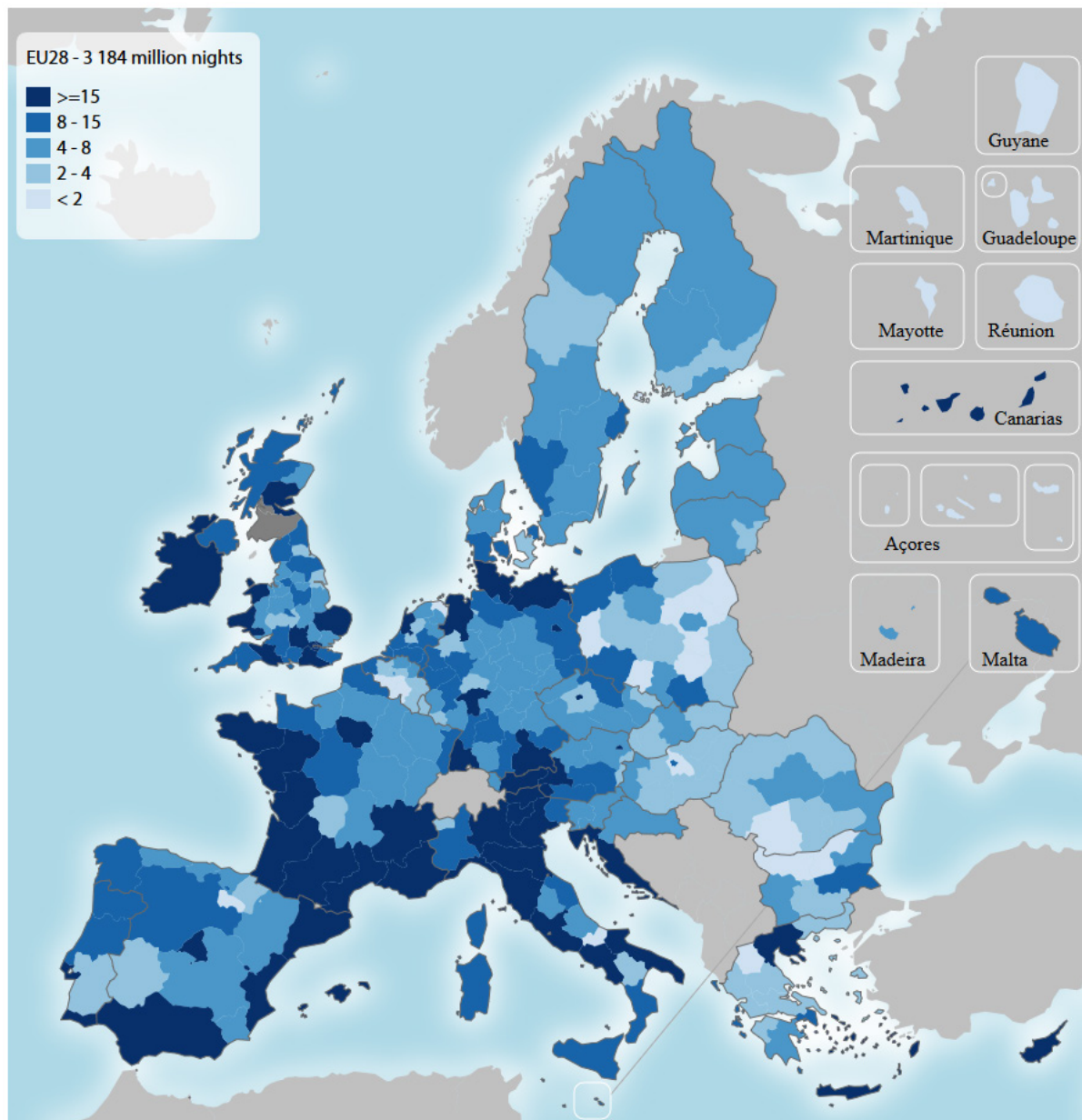
It is evident that many EU coastal regions are extremely popular tourist destinations. Nevertheless, competition from other non-EU global destinations is rising: travel has become more affordable with the offer of many low cost air companies and the digitalisation of services. In addition, as more countries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

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<sup>27</sup> Ecorys, [Study in support of policy measures for maritime and coastal tourism at EU level](#), 2013, p.5.

<sup>28</sup> Eurostat Regional Yearbook 2019, p. 146.

Figure 4 – Million nights spent in tourist accommodation in EU NUTS 2 regions in 2017 (apart from Ireland (2016 and only national data) and UK (2016 values))



Data source: [Eurostat \(online data code: tour\\_occ\\_nin2\)](#).

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.). However, mass tourism in certain EU regions also has negative consequences (pollution, excessive waste and wastewater, noise, real estate speculation). The 'touristification' of neighbourhoods (with the establishment of excessive numbers of bars, tourist shops, hotels and holiday apartments) may also be detrimental to the lives of the local inhabitants. Local and regional 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.<sup>29</sup> A Parliament study on [overtourism](#) shows that many coastal areas in the EU suffer from the negative consequences of mass tourism. In addition, climate change is also expected to affect coastal regions considerably (e.g. flooding, coastal erosion) thus weakening their tourism potential.<sup>30</sup>

Another challenge is posed by the fact that various local and regional economies may become extremely dependent on tourism (a trend known as 'tourism monoculture'). Seasonality is very high for some of these destinations, which see most of their customers in the spring and summer months. Diversification of the local tourism product 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 help create a host of new activities and the upgrading of professional qualifications may provide a source of diversification for local and regional economic sectors.

Other challenges relating to tourism have to do with human management, training, lack of professional skills, and a shortage of management and other skills needed to diversify the tourism product. Short-term contracts, challenging working conditions and seasonality do not facilitate the development of long-term career prospects. Given 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, in order to upgrade human capital and provide a better match for tourism market requirements.<sup>31</sup>

Coastal and maritime tourism can provide opportunities for growth. Nevertheless, profit comes at a price. Some forms of coastal and maritime tourism require careful maritime spatial planning and control in order to provide high safety standards. The cruise sector can be profitable for certain ports and coastal regions. However, cruise companies also try to capture as much passenger revenue as they can.<sup>32</sup> In addition, the environmental footprint of the cruise industry is considerable.<sup>33</sup>

These multiple challenges require a 'holistic' policy approach from the various policy agents and stakeholders. However, the tourism sector is particularly diverse and multi-layered. Lack of cooperation between stakeholders can hamper problem-solving. Cooperation is even more difficult in cross-border areas where different competing interests emerge.

Article 195 of the Treaty on the Functioning of the European Union ([TFEU](#)) states that: The Union shall complement the action of the Member States in the tourism sector, in particular by promoting the competitiveness of Union undertakings in that sector. To that end, Union action shall be aimed at: (a) encouraging the creation of a favourable environment for the development of undertakings in this sector; (b) promoting cooperation between the Member States, particularly by the exchange of good practice.

In 2014, the European Commission released a European strategy 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. The EU has also led a number of policy initiatives and laws in many fields relating to tourism (consumer protection, travel etc.).<sup>34</sup>

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<sup>29</sup> For further analysis see: Vasilis Margaras, [Major challenges for EU tourism and policy responses](#), EPRS, 2017.

<sup>30</sup> Ecorys, [Study in support of policy measures for maritime and coastal tourism at EU level](#), 2013, p.64.

<sup>31</sup> European Travel Commission, [European Tourism Manifesto for Growth & Jobs](#), 2015.

<sup>32</sup> Ecorys, Study in support of policy measures for maritime and coastal tourism at EU level, 2013, p.43.

<sup>33</sup> UNWTO, [Sustainable Cruise Tourism Development Strategies](#), 2016, pp. 40-47.

<sup>34</sup> For a number of EU achievements in fields related to tourism see: Vasilis Margaras, [Major challenges for EU tourism and policy responses](#), EPRS, 2017.



In its 2015 [resolution](#) 'New challenges and concepts for the promotion of tourism in Europe', Parliament encourages the Commission to examine the possibility of dedicating a section exclusively to tourism within the next multiannual financial framework, and calls for a new Commission strategy on EU tourism to replace or update the 2010 communication. It insists on stepping up efforts to improve Europe's branding as a tourist destination and on creating pan-European and transnational tourism products and services. It makes suggestions on achieving high-quality tourism products and on unlocking the potential of coastal and maritime tourism. The resolution calls on the Commission to promote sustainable, responsible and eco-friendly tourism in cooperation with strategic partners. It recommends that consideration be given to establishing an appropriate regulatory framework. Finally, it offers a number of possible ideas for promoting further digitalisation in tourism-related businesses.

Last but not least, the Parliament's [Committee on Transport and Tourism](#) has a tourism task force that focuses on tourism-related issues.

### 3.3. Maritime transport, ports and shipbuilding

Most blue economy activities need ships and rely on ports and the shipping industry. The two main sectors of this industry, shipbuilding and maritime shipping, are interlinked and depend strongly on international markets.

#### 3.3.1. Shipbuilding

Traditionally, shipyards in the EU used to build mainly larger seagoing vessels for the merchant fleet and for military purposes and later for the off-shore energy industry. However, the EU has gradually lost its leading position to Asian competitors, mostly on account of labour costs and steel prices. To counter this, the sector has specialised in building high-value market vessels (mostly cruise ships) and technologically sophisticated ships. Smaller shipyards tend to specialise, for instance in fishing vessels or mega-yachts. The sector also produces **marine equipment**, such as cordage, nets and specific textiles, as well as marine machinery and navigation instruments, and provides products and services for **ship maintenance, repair and conversion**. With more than 300 shipyards, the EU has a world market share of about 6 % in terms of tonnage and 19 % in terms of value on global order books, and up to 50 % for marine equipment.

Ship construction is a long process, with vessels delivered several years after orders are made. When the sector was hit by the 2008 economic crisis, ships ordered in the 2000s boom were still arriving. With the resulting overcapacity, demand for newbuilds dropped, except for liquefied natural gas (LNG) tankers, specialised offshore vessels and cruise ships. Future demand for newbuilds depends not only on economic factors, but also on the regulatory framework. Stricter requirements for ships' environmental performance (emissions) and energy efficiency (fuels) will require fleet renewal or adaptation.

The sector employs about **315 000** people (8 % of jobs in the established blue economy). Employment has dropped since 2009, hitting Germany, Poland and Spain in particular. The business model has changed towards more subcontracting. The workforce is ageing, with few young qualified workers entering, which could put both EU knowhow transmission and naval security at risk.

The Commission is seeking to revitalise the sector with [LeaderSHIP 2020](#), an initiative that supports employment and skills, access to financing, better market access and fair market conditions as well as research into clean, safe and energy efficient vessels. Under the [Horizon 2020](#) programme, the EU

has funded research and development [projects](#) to make shipping greener, 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. Through the European Fund for Strategic Investment (EFSI), the European Investment Bank (EIB) provides [loans](#) for investment in green shipping.

### 3.3.2. Maritime transport

Leaving deep sea transport aside, the blue economy focuses on **coastal and short sea shipping** of both passengers and freight. [Short sea shipping](#) represents a [third](#) of intra-EU exchanges in tonne-kilometres and is crucial for quality of life on EU islands and in peripheral maritime regions. In 2018, it employed about **232 000** people (6 % of jobs in the established blue economy). The sector also includes **inland water transport** and the rental and lease of water transport **equipment**.

#### Complex shipping rules

The global regulatory framework is set up by the International Maritime Organisation (IMO). Its [conventions](#) address technical matters, maritime safety and security, marine pollution, and also liability and compensation issues. The EU has transposed most IMO rules into its law and added further rules to prevent sub-standard shipping and oil spills, regulate access to the maritime transport market, safeguard social conditions and, more recently, prepare for [Brexit](#). National rules with limited geographical application complete the framework. To help enforce the EU rules, the European Maritime Safety Agency (EMSA) provides technical, operational and scientific assistance in the area of maritime safety, security and pollution prevention and response.

While transport demand from world trade is growing, the impact of shipping on the environment and [climate](#) has to be reduced, so as not to get out of control. The IMO and EU have tightened the rules on shipping pollution and greenhouse gas emissions. To comply, the industry will have not only to deploy the available means of emission reduction, but also to improve ships' energy efficiency and use alternative fuels, without compromising safety and efficiency.

Following up on the 2009 EU [maritime transport policy](#), in 2017 the Council set the [policy priorities](#) for 2020 and beyond: competitiveness, decarbonisation and digitalisation. The EU is promoting a modal shift towards waterborne transport to reduce road transport emissions and congestion. As part of the trans-European transport network (TEN-T), it is co-financing the development of regular maritime links transporting freight between sea ports ([motorways of the sea](#)) and [infrastructure](#) upgrades on inland waterways. Intra-EU shipping, however, has been hampered by heavy administrative rules. After the 2014 [simplification](#) of customs formalities for ships scheduled in regular services (mostly ferries), much is expected of harmonised [digital reporting](#) for ships, to be applied from 2025.

### 3.3.3. Ports

The EU has about 1 200 maritime ports. In 2017, they handled [4 billion](#) tonnes of [freight](#) and served 415 million ferry and cruise passengers. Port activities include **cargo handling, warehousing and storage, construction of water projects and services** relating to water transportation. Directly or indirectly, EU seaports support about 2.5 million jobs, of which the blue economy employs more than **half a million** people (14 % of jobs in the established blue economy).

Seaports differ in terms of size, function and geographical characteristics, ownership and governance structures, and are affected by the prevailing trade patterns. Most have had to cope with the need to accommodate ever larger ships, requiring adapted port infrastructure and

waterways, and services such as fast cargo handling, storage facilities and smooth hinterland connections, or passenger terminals and supply services. Moreover, the development of conventional and renewable energies has turned ports into energy hubs.

Ports generate employment and economic benefits, all the more if they become home to maritime clusters, typically bringing together port and logistics, shipping and maritime services, shipbuilding and repair. All this, however, increases traffic, giving rise to congestion and pollution, while also sharpening competition for land space. These [challenges](#) need to be addressed jointly by the port and the local area.

Following a [2013 communication](#) on port development, the EU opened [market 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 will oblige ports to accommodate [waste from ships](#), including marine litter. Having modernised and explained [State aid rules](#), the Commission also supports a European [social dialogue](#) between port workers and their employers.

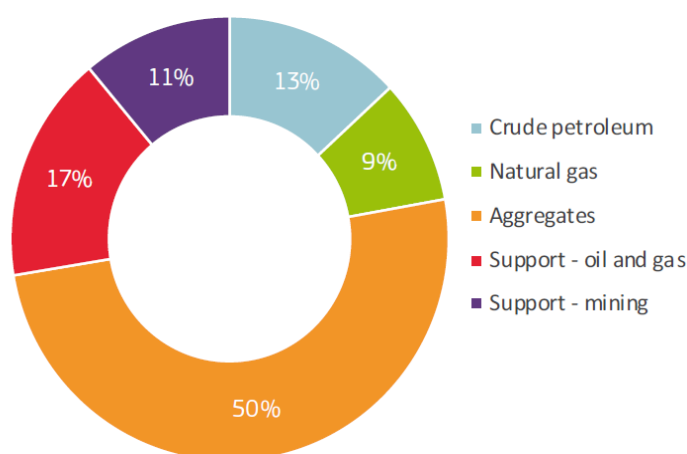
For the [329](#) TEN-T sea ports, the Commission has provided more than [€ 1 billion](#) in co-financing via the Connecting Europe Facility ([CEF](#)). Projects focus on improving port infrastructure, on hinterland connections and on innovation and greening projects (such as infrastructure to provide LNG as fuel and shore-side electricity for vessels at berth).

### 3.4. Marine extraction of oil, gas and minerals

The marine extraction of minerals, oil and gas is one of the most established economic sectors of the blue economy.

It 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 (combined – 28 %), offshore oil (13 %) and then natural gas (9 %) (see Figure 5).

Figure 5 – Employment by subsector in 2017



Source: The [2019 blue economy report](#).

Nevertheless, it is a sector in **decline**. 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. Poland, Germany, Italy and France account for most of the remainder. According to a [2018 academic study](#) on 'blue growth', the main reasons for decline in this sector are **low selling prices, high production costs**, and the development of **new onshore exploitation techniques**. However, the development of new and more efficient subsea exploitation systems could provide something of a boost to the sector in future, while recent increases in hydrocarbon (oil and gas) prices might make offshore reserves more economically viable. Recent plans to open [new production wells](#) in the North Sea point to the continued viability of offshore extraction if the conditions are right.

As offshore oil and gas reserves in the North Sea have been depleted, the question of **decommissioning** extraction facilities has become both an environmental challenge and an important motor of the blue economy. An external [study on investment in the blue economy](#), produced for the European Commission in 2018, suggests that decommissioning of offshore oil and gas platforms will require an investment of €30 billion over the next 30 years. Such investments are usually carried out by large companies and/or groups of investors in the energy and minerals sector. Future regulations as well as energy market trends will help to determine the costs and extent of decommissioning required and thus its relative weight in the blue economy.

## 3.5. Offshore wind and ocean energy

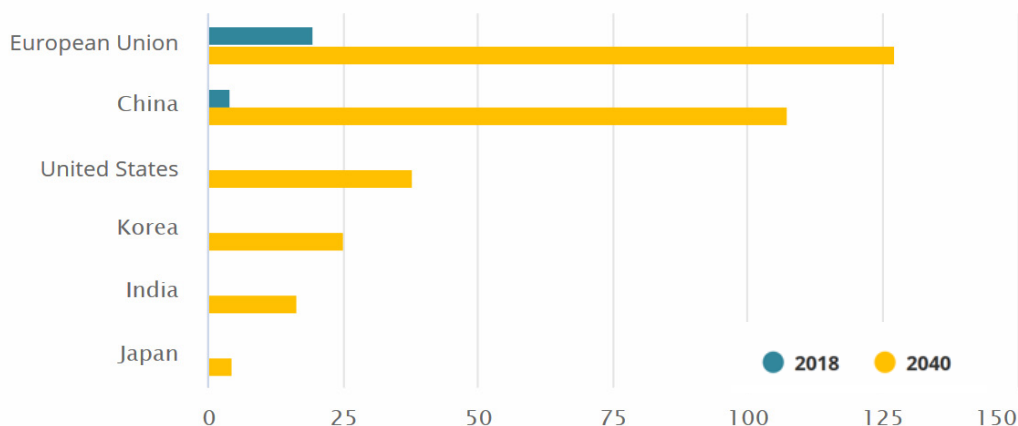
### 3.5.1. Offshore wind

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 (see Figure 6).

Figure 6 – Installed capacity of offshore wind (in gigawatt, 2018 versus 2040 in a stated policy scenario)



Source: The [Offshore wind outlook 2019 report](#) by the International Energy Agency (IEA).

### 3.5.2. Ocean energy

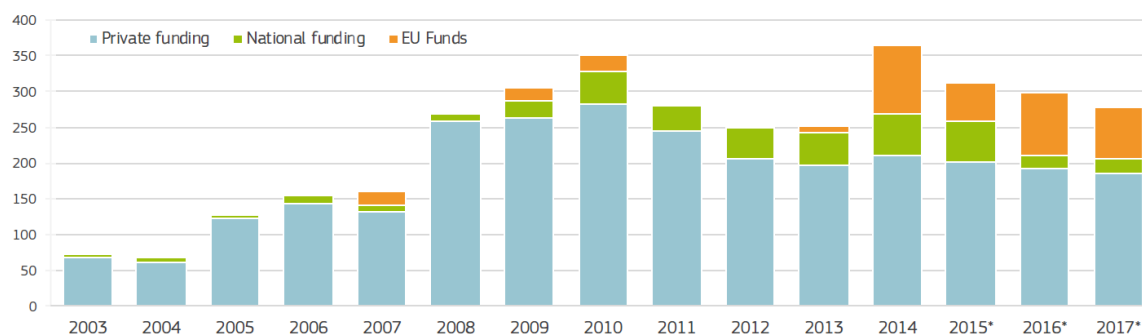
The ocean energy sector (tidal and wave power) is rather small in the EU but holds considerable promise. According to a [2012 United Nations report](#), tidal and wave power have the greatest **potential capacity** of all renewable energy sources, but they also tend to have the highest production costs. 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 (see box).

#### Examples of operational tidal power plants

The [Rance tidal power plant](#) in France was built in the 1960s as the first commercial scale generation of tidal wave power in the world, and continues to generate power today. The [Strangford Lough Tidal Turbine](#) in Northern Ireland (UK) became operational in 2008 and has the capacity to supply power to 1 500 homes. There are several completed or ongoing tidal power projects in Scotland (UK) including the [MeyGen tidal project](#), which will be the world's largest once work is completed.

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 (see also Figure 7). 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.

Figure 7 – Ocean energy R&amp;D expenditure (in € million, estimates for 2015, 2016 and 2017)



Source: The [2019 blue economy report](#) by the European Commission.

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 sceptical 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 commercialisation 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.

## 3.6. Other sectors

### 3.6.1. Blue biotechnology

Blue biotechnology generally refers to the use of **aquatic biological resources** for the purpose of biotechnological applications such as pharmaceuticals, cosmetics, food additives, animal feeds, biofuels and enzymes for detergents, papers and textiles. This does not include fisheries and aquaculture that provides products for human consumption, but it does include the use of by-products such as fish waste (e.g. for fish meal and fish oil),<sup>35</sup> and non-food use of algae. Detailed statistics by aquatic resource used in the blue bioeconomy sector is not available at EU level, but a Portuguese blue bioeconomy [report](#) shows that 45 % of the Portuguese stakeholders in the sector

<sup>35</sup> In view of the recent landing obligation, one relevant EU-funded research project in this area, [DiscardLess](#), looked into a better use of under-used [or unavoidable unwanted catches](#) in order to maximise the value of all catches.

use fish and by-products from the fishing industry, while 36 % use microorganisms (such as cyanobacteria, bacteria and fungi) and 31 % use algae (micro- and macroalgae).<sup>36</sup>

Overall employment data is not available, but a 2014 [study](#) for the European Commission estimated employment to be in the range of **11 500 to 40 000** jobs (mostly specialised, 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.

Similarly to the trend for aquaculture, worldwide algae production is showing impressive growth and tripled between 2000 and 2016 (with China as the main algae supplier, representing 47 % of global volume). EU production remained more static over time (representing only 0.2 % of global volume in 2016). France and Ireland are the main EU producers in terms of weight, although statistics for all Member States are unavailable or incomplete.

#### Examples of algae uses

The 2018 blue bioeconomy [report](#) from the European Market Observatory for Fisheries and Aquaculture Products ([EUFOMA](#)) provides an overview of the different (non-food) uses of aquatic biomass. For algae it mentions as primary uses the production of animal feed and fertilisers and the production of alginate for the pharmaceuticals and textiles industries (for their very good gelling and bioactive properties). New uses of algae include nutrition (e.g. Omega 3 and Omega 6 for human consumption), bioplastics, health treatments (cancer, obesity and diabetes) and bio-fuels.

A [blue bioeconomy forum](#), funded through the EMFF and launched in 2018 as a partnership of industry, public authorities, academia, and finance has been set up with the purpose of strengthening Europe's position in the blue bioeconomy. Its input has been used to develop a [draft](#) roadmap on the development of the EU blue bioeconomy.<sup>37</sup> Among the issues mentioned are the **unclear rules and regulations** that apply to blue bioeconomy activities,<sup>38</sup> also with regard to licences, the lack of solid market information, reliable statistics and scientific measurements to support decisions, a lack of funding (especially for start-ups) and labour skills. It notes that some activities generate **ecosystem services** that could be exploited in order to achieve **environmental targets**.

To stimulate innovation in the blue biotechnology sector, 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 aimed at identifying new and improving existing ways of bringing bio-based products and services to the market.<sup>39</sup> The first projects selected are expected to take off in 2020.

In a 2015 [resolution](#) on the blue economy, the European Parliament notes the immense potential of the blue biotechnology sector for creating new products with high added value and draws attention to the education and training requirements, implying a need for cooperation between Member States and the private sector. As part of its 2018 [resolution](#) on aquaculture, Parliament called on the Commission to support the industry in its efforts to reduce its dependence on wild fish stocks for the production of fish feed, including through increased use of seaweed and other algae, and to encourage the further development of the emergent seaweed sector.

<sup>36</sup> Although most of the companies use a single bioresource type, there are stakeholders using more than five types of bioresources (mostly large companies and academic research entities).

<sup>37</sup> The draft roadmap was subject to an [open consultation](#), which ended on 31 August 2019.

<sup>38</sup> e.g. there is a lack of clarity as to which main policy field they fall under: fisheries or agriculture are the most logical candidates but do not cover the activities' definitions sufficiently.

<sup>39</sup> The partners of the project have committed €23.5 million complemented with € 6.5 million in EU funding.

### 3.6.2. Seabed mining

Deep-sea mining refers to the extraction and processing of non-living resources in the ocean, in particular minerals and metals (e.g. cobalt, copper and zinc). To date, no commercial deep-sea mining has taken place in EU waters. Only a small number of Member States have sponsored licences, issued by the International Seabed Authority (ISA), for exploration on the seafloor in areas beyond national jurisdiction (ABNJ).<sup>40</sup> 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. With domestic production limited to about 3 % of world production, the EU depends heavily on imports of metallic minerals.<sup>41</sup> For this reason, in its [blue growth strategy](#), the Commission considers deep-sea mining to be one of the five sectors with high potential for growth and jobs.

#### Major deep-sea deposits of interest

- **polymetallic nodules** on deep abyssal plains (3 500 – 6 500 m; 80 % in ABNJ),
- **seafloor massive sulphides (SMS)** around active and extinct hydrothermal vents (1 000 – 5 000 m; 50 % in ABNJ),
- **cobalt-rich ferromanganese crusts** on sediment-free substrates such as seamounts (800 – 4 000 m).

However, deep-sea mining is highly controversial owing to the risks it poses to marine environments and communities (e.g. destruction of vulnerable marine ecosystems, and dust, light and noise pollution). As our understanding of the deep-sea environment is limited, further scientific knowledge is needed on the effects of mining. Emerging [evidence](#) suggests deep-sea mining to have significant adverse effects,<sup>42</sup> as many deep-sea species are slow-growing and reproducing. In recent years, the EU has funded major research projects such as [MIDAS](#), [Blue Mining](#) and [Blue Nodules](#) in order to investigate the environmental impacts of deep-sea mining and develop sustainable solutions.

In its [resolution](#) on ocean governance, the European Parliament stresses the importance of applying the precautionary principle in relation to the emerging deep-sea mining sector, and calls on the Commission and EU Member States to 'support an international moratorium on commercial deep-sea mining exploitation licences until such time as the effects of deep-sea mining on the marine environment, biodiversity and human activities at sea have been studied and researched sufficiently and all possible risks are understood'. Instead of further promoting the sector, as in the blue growth strategy, the European Parliament calls on the EU to invest in sustainable alternatives, specifically in a transition to sustainable consumption and production, as outlined in SDG 12 under Agenda 2030 and the Commission's efforts in moving towards a more circular economy.

<sup>40</sup> Among the EU Member States, Belgium, Bulgaria, Czechia, Germany, France, Poland, Slovakia the United Kingdom, have sponsored licences for polymetallic nodules in the Pacific Ocean (Clarion-Clipperton Fracture Zone) as well as for seafloor massive sulphides in the Atlantic Ocean (Mid-Atlantic Ridge) and the Indian Ocean (Central Indian Ridge).

<sup>41</sup> The Commission has identified a [list of critical raw materials](#) with high supply-risk, high economic importance and lack of substitutes for which reliable and unhindered access is a concern to European industry and sustainable value chains.

<sup>42</sup> The extraction of nodules requires dredging, which could cause sediment plumes with sub-lethal effects on organisms and possible bioaccumulation of metals in the ecosystem as far as 1-2 km from the extraction site. Modelling studies suggest long-term effects with incomplete recovery after two decades post extraction. Mining on crusts or seafloor massive sulphides implies direct destruction of seamounts and hydrothermal vents, key habitats for deep-sea biodiversity that is already under pressure.



### Legal framework for the international seabed

The [United Nations Convention on the Law of the Sea](#) (UNCLOS), and its 1994 [Implementing Agreement relating to Part XI](#), provide the overarching legal framework for any seabed mining activity. UNCLOS declared the seabed and ocean floor ('the Area') to be beyond national jurisdiction and its mineral resources the 'common heritage of mankind', to be administered for the benefit of mankind as a whole (Articles 136, 137 and 140). The International Seabed Authority ([ISA](#)) was established to regulate and control all related activities. UNCLOS emphasises that the Area must be used exclusively for peaceful purposes (Article 141) and further requires all necessary measures to be taken in order to ensure effective protection for the marine environment from harmful effects that may arise from mining-related activities, including exploration and exploitation (Article 145).

### 3.6.3. Desalination

Desalination refers to the process of removing salts and minerals from marine or brackish water in order to produce water suitable for human consumption or irrigation. In the EU, most desalination plants use **reverse osmosis** technology (84 % of the current operating plants and an expected 96 % of newly contracted desalination capacity), a well-developed process in which pressurised water flows through a membrane to separate dissolved materials from the water.

Currently there are **2 352** desalination plants in the EU producing a total of 9.5 million m<sup>3</sup> of fresh water per day, representing approximately 4.2 % of total public water supply. Most of the EU capacity is installed in Spain (68 %), followed by Italy (9 %), Cyprus (8 %), Malta (5 %) and Greece (3 %). Together they represent 93 % of EU capacity. Employment figures are relatively low, rough estimates indicating that the sector employs around **3 800** people excluding construction and R&D.

The water desalination sector is neither one of the large established sectors nor one of the five focus areas of the blue growth strategy. Nevertheless it is becoming increasingly important owing to **growing fresh water shortages** in dry regions, and the number of plants is expected to increase over the next few years. A 2018 [study](#) published by the JRC assesses the projected future impacts of climate change, land use change and changes in water consumption on water resources and shows that current pressures on water resources will become even more unsustainable under a 2°C climate change scenario in the Mediterranean area, and especially in Spain. Besides the Mediterranean, most of the new desalination demand is expected to come from the Middle East and northern African regions. The Union is therefore also co-funding new plants outside the EU as part of development support (e.g. currently in [Gaza](#)).

Desalination is an **energy intensive technology**<sup>43</sup> and produces **residual content**<sup>44</sup> as well. One challenge will be to reconcile growth in this sector with environmental and greenhouse gas emission reduction EU targets. In principle, the energy needed could come from renewable energy sources while innovative solutions might lead to full recovery of mineral resources. A [2019 JRC report](#) highlights the scope for a more holistic policy approach, mainstreaming EU climate, environment and energy policies and objectives into revision or updates of the [water framework](#), [urban waste water treatment](#), and [energy efficiency](#) directives. In particular, it recommends exploring the role of desalination, powered by **renewable energy**, as a viable source of freshwater.

<sup>43</sup> The International Energy Agency (IEA) estimated in the [World Energy Outlook 2016 report](#) that global energy use in the water sector would double by 2040, with the largest increase coming from desalination, which would grow over eight-fold, and account for more than 20 % of water-related electricity demand in 2040.

<sup>44</sup> With reverse osmosis, each cubic meter of freshwater produces about one cubic meter of brine, including a relatively high concentration of minerals.

Concretely it describes an integrated renewable power generation solution involving photovoltaic panels possibly combined with a water reservoir upstream of the desalination plant as a way to store excess solar energy and allow the reverse osmosis feed to be 'pre-pressurised'.

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The blue economy encompasses all economic activities relating to oceans and seas. It employs over 4 million people in the EU and its landscape is evolving rapidly. Some traditional sectors are in decline while other sectors, both established and emerging, are showing strong potential for growth and innovation. This paper focuses on the EU policy framework and the various EU initiatives and actions linked to the blue economy. It provides an overview of the cross-cutting 'key enablers' and a sector by sector analysis. The international dimension or the position of the European Parliament is highlighted where relevant.

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