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# BLUE ECONOMY IN THE MEDITERRANEAN

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# Introduction

## 1.1. The Blue Economy

The Blue Economy is “the set of human activities depending on the sea and/or underpinned by land-sea interactions in the context of sustainable development, and notably including industrial and service sectors such as aquaculture, fisheries, blue biotechnologies, coastal and maritime tourism, shipping, ship-building/repair, ports, ocean energy and marine renewable energy, including offshore wind, which are among the main traditional and emerging economic maritime sectors in the Mediterranean Sea basin”1. UN Environment defines the Blue Economy as a "green economy in a blue world", since "a global transition to a low-carbon, resource-efficient Green Economy will not be possible unless the seas and oceans are a key part of these urgently needed transformations"2. The goal of the Blue Economy is therefore to face the global, environmental, economic and social crises of the last decades, looking at the ocean resources as development spaces that, used sustainably, may trigger economic prosperity.3

Since ancient times, the Mediterranean Sea has played a key role in the economy of coastal communities and States. Today, more than ever, the Blue Economy sectors are an important engine for the region's economy, with enormous potential for innovation and for sustainable and inclusive prosperity. The economic opportunities provided by the Mediterranean Sea are accompanied by an increasingly need for a management that is respectful of its ecosystems and is able to maintain and increase their value over time. Sustainable conversion of economic sectors that have often adversely affected the health of ecosystems, such as fisheries and coastal tourism, as well as the development of new clean and technologically advanced activities – e.g. renewable energy –, represent important opportunities for innovation and employment for the benefit of all Mediterranean countries. Close collaboration between all the Mediterranean countries and their stakeholders is a condition for realising a common objective: the sustainable use and conservation of our main common resource, the Mediterranean Sea.

The purpose of this paper is to provide a brief overview of the current state of the Blue Economy in the Mediterranean, highlighting challenges, opportunities, trends, and their potential for sustainable development.

The present compilation uses official data to describe the current situation and outlook in economic terms for each sector, e.g. economic growth and employment, closely related to the conservation of natural resources and marine ecosystems. While the Blue Economy is viewed with a broad regional perspective, special attention is given to the Southern and Eastern Mediterranean Countries (SEMCs). Concrete

[1] Union for the Mediterranean (2015), Ministerial Conference on Blue Economy, http://ufmsecretariat.org/wp-content/uploads/2015/11/2015-11-17-declaration-on-blue-economy_en.pdf

[2] UN Environment: www.unep.org/

[3] Another recent definition of the concept was provided by World Bank, which in its "The Potential of the Blue Economy" report (2017) says: " it is understood here as comprising the range of economic sectors and related policies that determine whether the use of oceanic resources is sustainable", https://openknowledge.worldbank.org/handle/10986/26843

examples are provided of good practices in the Blue Economy in the Mediterranean region, enabling best practices and knowledge sharing and regional collaboration.

## 1.2. Institutional Frameworks

Blue Economy implementation strategies are part of the **UN's Sustainable Development Goals (SDGs),** in particular **SDG 14 "Life Below Water"**[4] which aims, among other things, to prevent and significantly reduce marine pollution, sustainably manage and protect marine and coastal ecosystems, minimize and address the impacts of ocean acidification, regulate harvesting by ending overfishing and illegal, unreported and unregulated fishing, conserve coastal and marine areas, increase scientific knowledge and transfer sustainable marine technologies.

In the Mediterranean region, international institutions such as **UN Environment and its Mediterranean Action Plan (UNEP/MAP)**, the **Union for the Mediterranean** (**UfM)** and the **European Union (EU)** are working to coordinate their strategies for a Sustainable Blue Economy, in line with the Mid-term strategy of the **General Fisheries Commission for the Mediterranean (GFCM)[5],** the **EU's Blue Growth long term strategy**[6] (which includes the EU's Strategy for the Adriatic and Ionian Region), and the **Mediterranean Strategy for Sustainable Development 2016-25 (MSSD)[7]** which was adopted by all the Contracting Parties of **the Barcelona Convention (BC)**.

The **Barcelona Convention** (for the Protection of Marine Environment and the Coastal Region of the Mediterranean) is a regional sea programme adopted in 1995 that now entails 22 Contracting Parties[8]. Its main purpose is to "*protect the Mediterranean marine and coastal environment while boosting regional and national plans to achieve sustainable development*". Contracting Parties regularly take part in Ministerial meetings, during which they decide on Mediterranean Action Plan (MAP) strategies, budget and programme. It is therefore an important point of reference for the Mediterranean Blue Economy.

The **Mediterranean Strategy for Sustainable Development 2016-25** provides a strategic policy framework for all stakeholders and partners to adapt the 2030 Sustainable Development Agenda to the regional, sub-regional, and national levels, securing a sustainable future for the Mediterranean region consistent with the SDG. The MSSD is based on the principle that socio-economic development needs to be harmonized with the environment and protection of natural resources. It addresses key areas of the marine and coastal environments impacted by human activity, using an ecosystem-based approach and planning tools such as Integrated Coastal Zone Management (ICZM).[9]

[4] Sustainable Development Goal 14: https://sustainabledevelopment.un.org/sdg14
[5] General Fisheries Commission for the Mediterranean (GFCM): www.fao.org/gfcm/activities/fisheries/mid-term-strategy/en/
[6] European Commission – Blue Growth: https://ec.europa.eu/maritimeaffairs/policy/blue_growth_en
[7] The Mediterranean Strategy for Sustainable Development (MSSD) 2016-2025: http://www.unep.org/unepmap/mediterranean-strategy-sustainable-development-mssd-2016-2025
[8] Albania, Algeria, Bosnia and Herzegovina, Croatia, Cyprus, Egypt, the European Community, France, Greece, Israel, Italy, Lebanon, Libya, Malta, Monaco, Montenegro, Morocco, Slovenia, Spain, Syria, Tunisia, Turkey.
[9] UNEP, MAP (2016), The Mediterranean Strategy for Sustainable Development (MSSD) 2016-2025

The **UfM Ministers** gathered in Brussels in November 2015 to promote the Blue Economy, agreed on "*the need for the Mediterranean region to make the best use of the potential of the blue economy, to promote growth, jobs and investments and reduce poverty, whilst safeguarding healthy seas and developing a clear vision for the sustainable and integrated development of marine and maritime sectors at national and sea basin level",* while recognizing *"the need to ensure that the policies and actions required to promote the blue economy are clearly identified as priorities and reflected as far as appropriate in national strategies"*[10].

## 1.3. Sectors overview

The state of the Blue Economy (BE) in the Mediterranean is analysed for the following economic sectors which economic value is mainly based or supported by marine natural ecosystems and maritime resources:

- Tourism (coastal)
- Fisheries and Aquaculture
- Maritime Transport and Port activities
- Shipbuilding and Recycling
- Energy (offshore)
- Bioprospecting
- Deep-sea Mining

Compared to the other sectors of the Blue Economy (BE), **tourism** in coastal areas has by far the highest Gross Value Added[11] (83% of the total EUR 169 bn BE GVA) and the highest employment (79% of the total 4.2 million BE jobs) as shown in the figures below:

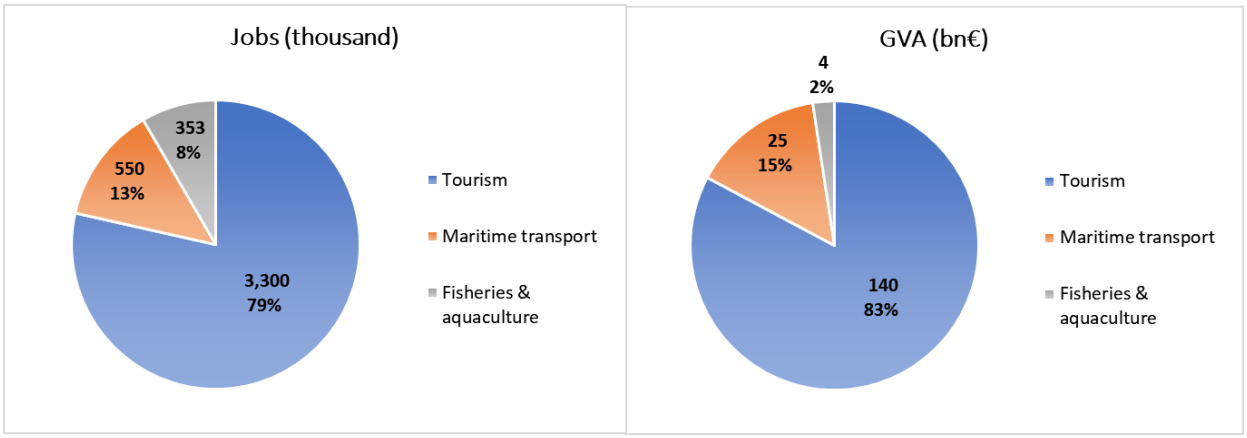


**Figure 1: Distribution of the main socioeconomic indicators of Blue Economy sectors (Plan Bleu, 2014)**

[10] EU, UfM, Hashemite Kingdom of Jordan (2015), Union for the Mediterranean Ministerial Conference on Blue Economy, http://ufmsecretariat.org/wp-content/uploads/2015/11/2015-11-17-declaration-on-blue-economy_en.pdf

[11] Gross Value Added (GVA): value of the amount of goods and services that have been produced, less the cost of all inputs and raw materials that are directly attributable to that production.

Although this report dedicates a separate chapter to each sector, there are evident **interlinkages** between them: for instance, tourists require maritime transport and enjoy traditional fish or sea food; offshore wind energy may interfere with fishing activities; shipbuilding and recycling depend largely on demand from the transport sector. Some innovative activities (e.g. fishing tourism) further emphasize the importance of integration between different sectors. For this reason, the adoption of a **cross-sectoral approach** is crucial to analysing and developing strategies.

One key example for the importance of a cross-sectorial approach in a sustainable Blue Economy is the implementation of **Marine Protected Areas** (MPAs) that have benefits on several economic sectors such as coastal tourism or fisheries.

**A cross-sectorial case with the Marine Protected Areas (MPAs)**

In the Mediterranean Sea, there are 1,231 Marine Protected Areas (MPAs) and other effective area-based Conservation Measures (OECMs), covering around 7% of the surface[12]. There is still potential to increase these areas, as under the Convention on Biological Diversity and the Barcelona Convention, 10% of the Mediterranean Sea should be declared a Marine Protected Area. As can be seen on the following map, most MPAs are located in the Northern Mediterranean, and only a few can be found along the coasts of Morocco, Algeria, Tunisia and Lebanon[13].

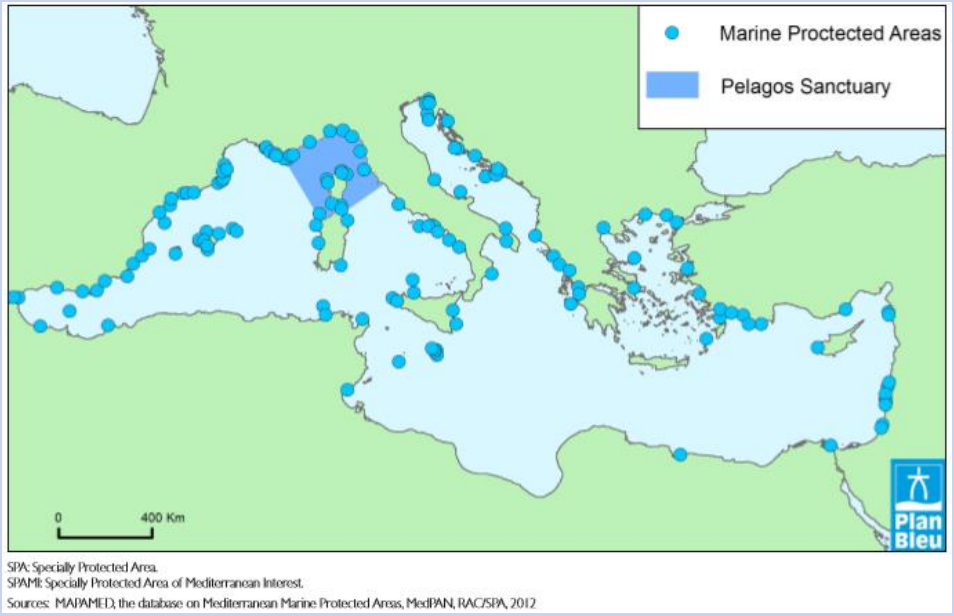


**Figure 2: Marine and Coastal Protected Areas in the Mediterranean (Plan Bleu 2013)[14]**

[12] MedPAN, UNEP/MAP-RAC/SPA (2016), The 2016 Status Of Marine Protected Areas In The Mediterranean, http://d2ouvy59p0dg6k.cloudfront.net/downloads/medpan_forum_mpa_2016___brochure_a4_en_web_1_.pdf

[13] European Environment Agency (2015), Marine Protected Areas in Europe's seas, www.eea.europa.eu/publications/marine-protected-areas-in-europes

[14] Mangos A., Claudot M.-A. (2013). Economic study of the impacts of marine and coastal protected areas in the Mediterranean. Plan Bleu. https://www.cbd.int/doc/meetings/mar/ebsaws-2014-03/other/ebsaws-2014-03-submission-plan-bleu-en.pdf

By protecting marine habitats, MPAs can provide more sustainable tourism and recreational benefits, as well as enhancing fish stocks for fisheries. It has been estimated that expanding the coverage of MPAs to 10% or even 30% would lead to benefits greatly exceeding costs by **3- to 19-fold**.[15] More specifically, after becoming MPA in 1995, the number of dives in **Cabo de Palos (Spain)** increased by 225% between 1998 and 2010, which led to **local added value of EUR 870,000 per year** and an **additional 20 local jobs**[16]. A similar effect was studied for **Tunisia** where an increase in diving activities of between 3% and 5% is expected, thanks to the creation of an MPA where higher protection has increased the attraction of the area[17]. The overall development of an increasing-protection scenario is shown below:

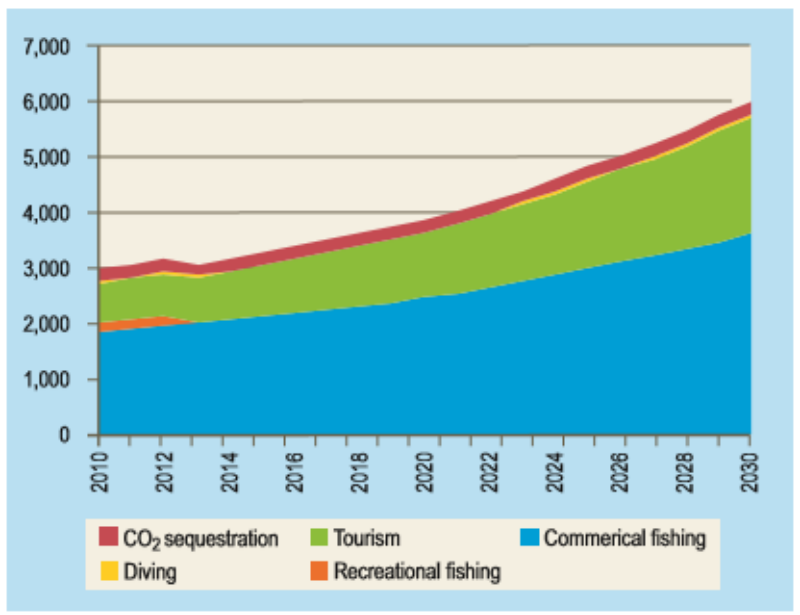


**Figure 3: Kuriat Islands, Tunisia - Evolution of benefits and costs (in thousands of euros) in a scenario of increasing MCPA protection. Plan Bleu 2013**

Taking into consideration the interlinkages between the different sectors, the Barcelona Convention adopted in 2008 the **Integrated Coastal Zone Management (ICZM)** protocol[18]**,** entered into force in 2011. ICZM is defined as "*a dynamic process for the sustainable management and use of coastal zones, taking into account at the same time the fragility of coastal ecosystems and landscapes, the diversity of activities*

[15] Brander, L. et al. (2015), The Benefits to People of Expanding of Marine Protected Areas, IVM Institute for Environmental Studies, Amsterdam; http://assets.wnf.nl/downloads/mpa_rapport_volledig.pdf. The study found that the total ecosystem service benefits of reaching 10% coverage of MPAs would be USD 622-923 billion over the period 2015-2050.
[16] García-Charton, J.A., Lorenzi, M. R., Calò, A., Treviño Otón, J., Irigoyen A., Hernández Andreu, R., Muñoz Gabaldón, I., Marcos, C., Pérez Ruzafa, Á. (2013) Estudios de seguimiento de la reserve marina de Cabo de Palos – Islas Hormigas. http://www.proyectopescares.com/wpcontent/uploads/2014/09/Informe_CPalos_UMU_2013.pdf
[17] Mangos A., Claudot M.-A. (2013), Economic study of the impacts of marine and coastal protected areas in the Mediterranean
[18] Protocol on Integrated Coastal Zone Management in the Mediterranean: *http://www.pap-thecoastcentre.org/about.php?blob_id=56&lang=en*

*and uses, their interactions, the maritime orientation of certain activities and uses and their impact on both the marine and land parts".*[19]

Similarly, recognizing that the *"high and rapidly increasing demand for maritime space for different purposes such as installations for the production of energy from renewable sources, oil and gas exploration and exploitation, maritime shipping and fishing activities, ecosystem and biodiversity conservation, the extraction of raw materials, tourism, aquaculture installations and underwater cultural heritage, as well as the multiple pressures on coastal resources, require an integrated planning and management approach"*, the European Parliament and the Council adopted in 2014 a directive to create a **common framework for Maritime Spatial Planning (MSP)** in Europe[20]. The expected benefits of this initiative are the reduction of conflicts between sectors, an increased cross-border cooperation, as well as the protection of the environment thanks to the early identification of impact and opportunities for multiple use of space[21].

[19] European Union (2009), Protocol on Integrated Coastal Zone Management in the Mediterranean, Official Journal of the European Union, http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:22009A0204(01)&from=EN

[20] European Union (2014), Directive 2014/89/EU of the European Parliament and of the Council of 23 July 2014 establishing a framework for maritime spatial planning, Official Journal of the European Union, http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0089&from=EN

[21] European Commission, Maritime Spatial Planning: https://ec.europa.eu/maritimeaffairs/policy/maritime_spatial_planning_en

# Status and potential of the Blue Economy in Tourism

## 2.1. Overview

The concept of sustainable tourism was discussed for the first time during the "Earth Summit" held in 1992 in Rio. It has become such an important concern that the United Nations declared the year 2017 as the "**International Year of Sustainable Tourism for Development**".

Sustainable tourism relies on three pillars: **environmental integrity, economic development and social justice**. It is defined by the World Tourism Organization (UNWTO) as "*tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment and host communities. Sustainable tourism should thus make optimal use of environmental resources, respect host communities and ensure viable, long-term economic operations, providing benefits that are distributed fairly among all stakeholders*"[22].

Sustainable tourism has a significant role to play in environmental conservation and in driving socioeconomic development. It is mentioned in several of the **Sustainable Development Goals** (SDGs), including:

- **Target 8.9**: By 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products.
- **Target 12.b**: Develop and implement tools to monitor sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products.

Developing the tourism sector sustainably is also essential to achieving Objective 1 of **the Mediterranean Strategy for Sustainable Development 2016-2025 (MSSD), i.e.** "ensuring sustainable development in marine and coastal areas", as well as Objective 5 of a "transition towards a green and a blue economy".

[22] UNEP, UNWTO (2005), Making Tourism More Sustainable - A Guide for Policy Makers, http://www.unep.fr/shared/publications/pdf/dtix0592xpa-tourismpolicyen.pdf. The definition has remained the same since then.

## 2.2. Current status

### 2.2.1. Tourism's increase in the Mediterranean area

The Mediterranean is the world's leading tourist destination, both in terms of international and domestic tourism. In 1970, 58 million International Tourist Arrivals (ITAs) were registered in Mediterranean countries. By 2014, this number had increased to 314 million, and the region was expected to attract 355 million ITAs in 2016[23], half of these in coastal areas.

However, it is important to note that the top five destinations in the Mediterranean account for more than 80% of the region's total international tourist arrivals (ITAs): France (83.7 million ITAs in 2014), Spain (65 million), Italy (48.5 million), Turkey (40 million) and Greece (22 million)[24]. Moreover, while the North-West Mediterranean accounted for 64% of ITAs, South East Mediterranean accounted for only 17% of them, North East Mediterranean for 14% and South West Mediterranean for 5%.

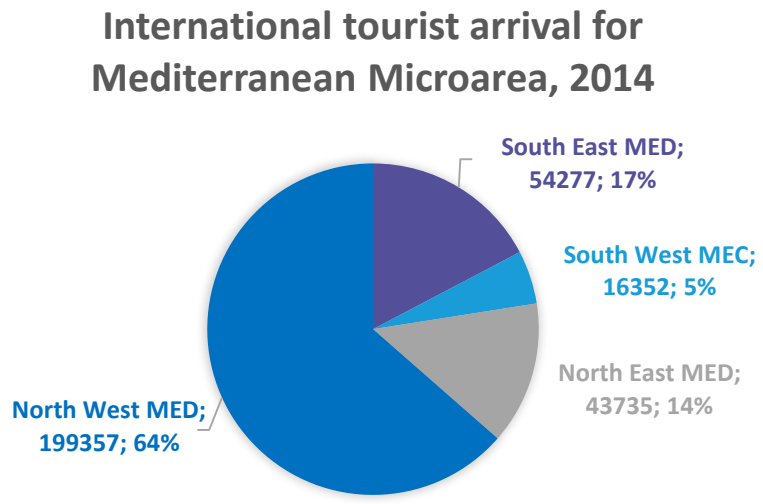


**Figure 4: International tourist arrivals in the Mediterranean region in 2014 (Plan Bleu)**

The growth potential for tourism is thus important in Southern and Eastern Mediterranean Countries (SEMC), such as Morocco or Egypt (around 10 million ITAs each), Tunisia or Israel, even though it could cannibalize parts of the sector in northern countries.

[23] WTTC (2016), Travel & Tourism – Economic impact 2016 Mediterranean

[24] UNEP, MAP, Plan Bleu (2016), Tourism and sustainability in the Mediterranean: key facts and trends, http://planbleu.org/sites/default/files/publications/tourism_and_sustainability_june2016.pdf
Those numbers include the entire countries, not only the coastal areas.

## 2.2.2. Central role in the region's economy

In 2015, the direct **contribution of tourism to the Gross Domestic Product** (GDP) of Mediterranean countries was USD 354 bn (4.5% of the regional GDP) whereas the total contribution (direct, indirect and induced) was USD 901 bn (11.6% of the GDP)[25]. This is expected to reach 12.5% of the region's GDP by 2026 (USD 923 bn). In terms of jobs, tourism (coastal and inland) represented **11.5% of total employment** in 2015 in the Mediterranean economies (19.8 million jobs, of which 7.8 million direct jobs). This is also expected to increase, and reach 12.4% of total employment in 2026[26].

At a sub-regional level, the total **contribution of travel & tourism to GDP** in North African Mediterranean countries (Algeria, Egypt, Libya, Morocco and Tunisia) was USD 58 bn in 2016 (9.7% of GDP) and is forecast to rise by 4.3% per annum to USD 90 bn by 2027 (10.0% of GDP)[27]. In terms of employment, the sector generated 2.19 million jobs directly in 2016 (4% of total employment), and should account for 2.8 million jobs in the region by 2027, an increase of 2.7% per annum over the next ten years.

The following graph displays the contribution of travel & tourism to direct, indirect and induced employment[28].

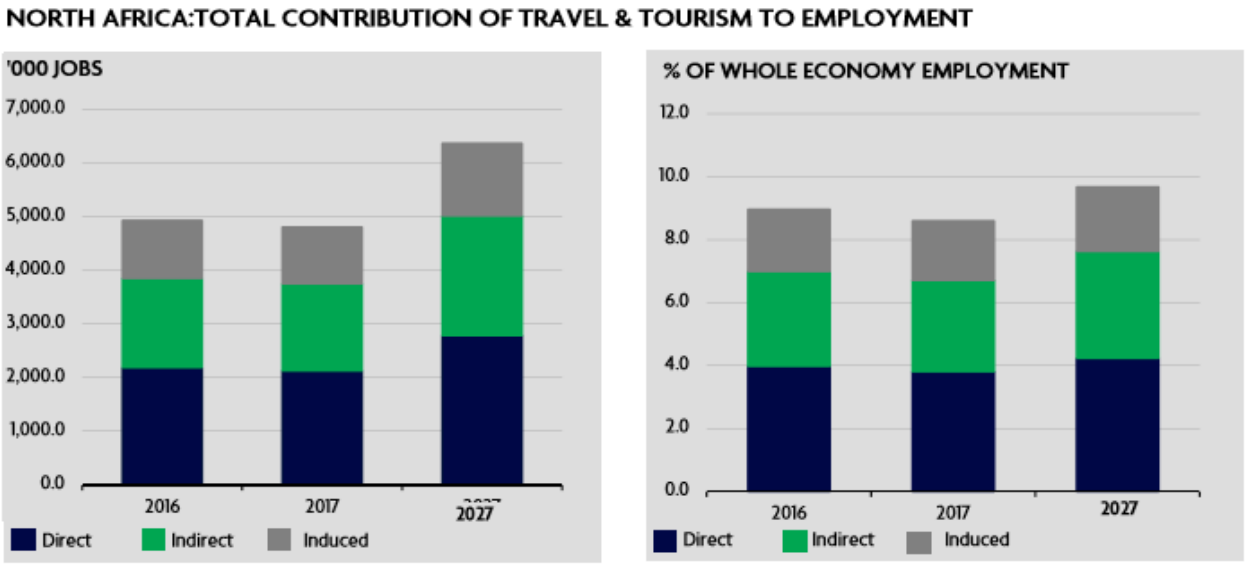


**Figure 5 and 6: Total contribution of Travel & Tourism to employment in North Africa. Source: WTTC 2017, North Africa**

[25] WTTC (2016), Travel & Tourism – Economic impacts 2016 Mediterranean
[26] Ibid.
[27] WTTC (2017), Travel & Tourism – Economic impact 2017 North Africa, https://www.wttc.org/-/media/files/reports/economic-impact-research/regions-2017/northafrica2017.pdf
[28] Direct employment includes jobs from hotels, travel agents, airlines and other passenger transportation services, as well as restaurant and leisure industries directly supported by tourists; indirect employment includes travel & tourism investment spending, government spending, purchases from suppliers; induced employment includes spending of direct and indirect employees on e.g. food, housing, etc.

The average contribution of tourism to GDP and employment is lower in North African Mediterranean countries than for the Mediterranean region as a whole. This is especially due to the low level of tourism in Algeria and Libya.

In **Tunisia** the tourism sector's contribution to GDP and employment is higher than the Mediterranean average: it was USD 5.7 bn in 2016, which accounts for 13.7% of GDP. It is forecast to rise by 3.4% per annum to USD 8 bn, in 2027[29]. In 2016, this represented 430,000 jobs, i.e. 12.6% of total employment. It is expected to rise by 0.7% per annum to 464,000 jobs in 2027 (12.3% of total). In Tunisia most tourists spend their vacation on the Mediterranean coast.

### 2.2.3. Valuable world heritage sites

The coastal area of the Mediterranean region is hosting a large number of valuable world heritage sites protected by the UNESCO World Heritage Center. In many countries (Portugal, Italy, Malta, Tunisia, Egypt, Cyprus, among others) the majority of those sites, if not all of them, are located at a very short distance from the coast line. They are major touristic attractions for local and foreign visitors and should be promoted, in a responsible way, to educate and acknowledge the common history and culture of the Mediterranean community.

## 2.3. Challenges

If not managed properly, it is widely recognized that tourism can bring about negative environmental externalities in the Mediterranean. Some of the most serious environmental impacts are the following:

- **Pressures on local ecosystems, land and biodiversity losses**, for instance due to building tourism facilities or increased waste. It is estimated that in some countries (France, Italy and the Balkan States), more than half the coastline is now paved[30];
- **Marine/beach litter**: 52% of marine and beach litter come from coastal tourism in EU Member States[31];
- **Water pollution** caused by urban waste production, tourist facilities or cruise ship sewage systems;
- **Air pollution and greenhouse gas emissions** from transport and tourism facilities have greatly increased in the last decades, especially due to increasing air transport in the Mediterranean;
- **Demand for natural resources**: in particular water, food, fossil fuels (high energy consumption by the sector, linked mainly to transportation and accommodation);

[29] WTTC (2017), Travel & Tourism – Economic impact 2017 Tunisia, https://www.wttc.org/-/media/files/reports/economic-impact-research/countries-2017/tunisia2017.pdf
[30] Starr S. (2015), The Mediterranean's urban sprawl: 'You know a city's near by the plastic in the sea', The Guardian, https://www.theguardian.com/cities/2015/jan/20/mediterranean-urban-sprawl-kayak
[31] WWF (2017), Reviving the economy of the Mediterranean Sea, http://www.wwf.gr/images/pdfs/Reviving_Mediterranean_Sea_Economy_Full%20rep_Lowres.pdf

- **Decrease in the aesthetic value of landscapes** due to urbanization and infrastructure development.

***Case Study on Cruise tourism***

In 2013, 136 cruise ships were deployed in the Mediterranean[32] and **27 million cruise passengers** went through Mediterranean ports[33]. 75% of these are located in Italy, Spain, France, Greece, Croatia, Slovenia; 9% in Turkey and Cyprus and only 7% in North Africa[34]. This is especially due to a lack of infrastructures in the Southern Mediterranean: La Goulette (Tunisia) and Alexandria (Egypt) are the only ports with infrastructures comparable to the Northern ports[35]. Moreover, parking, bus and taxi services must be available, and a short distance between the port and tourist attractions is preferred, which is often not the case in Southern Mediterranean destinations.

Cruise tourism in the Mediterranean has been rising in recent years. The share of the Mediterranean Sea as a global destination for cruise tourism increased from 18% in 2008 to 22% in 2011 despite the financial crisis, and is expected to grow in the coming years due to growing European market demand[36]. However, cruise tourism can have significant environmental impacts, including water pollution caused by waste production or cruise ship sewage systems. It is estimated that cruise ships in the Mediterranean can produce up to **800 million litres of wastewater per year** that can be discharged at sea without treatment[37].

The development of sustainable practices is thus necessary to decrease the environmental impact of the sector. Cruise companies have several options to do so, including[38]:

- Switching to modern engines that lower emissions and eliminate haze;
- Adopting mechanisms of ballast water control, according to the Ballast Water Management Convention;
- Choosing mooring locations to avoid anchor damage to the sea floor and disruption of benthic habitats;
- Treating sewage before discharge within 4-10 miles of land;
- Shifting from dirty heavy fuel oil to a low sulphur fuel;
- Using scrubbers (pollution control systems) to decrease nitrogen oxide emissions (NOx).

[32] MedCruise (2017), Cruise Activities in MedCruise Ports 2016
[33] UNEP, MAP, Plan Bleu (2016), Tourism and sustainability in the Mediterranean: key facts and trends, http://planbleu.org/sites/default/files/publications/tourism_and_sustainability_june2016.pdf
[34] Plan Bleu (2011), Cruises and recreational boating in the Mediterranean, http://planbleu.org/sites/default/files/upload/files/2-1-EN_Croisiere%26plaisance.pdf
[35] Ibid.
[36] WWF (2015), Blue Growth in the Mediterranean Sea: the challenge of good environmental status, http://d2ouvy59p0dg6k.cloudfront.net/downloads/medtrends_regional_report.pdf
[37] Ibid.
[38] Ibid.

## 2.4. Opportunities and benefits

Sustainable coastal tourism in the Mediterranean is thus essential for socio-economic development of the local territories and communities. But it should "*develop and promote practices and solutions to ensure efficient use of natural resources and reduce environmental impacts of tourism, respecting spatial, ecological, and socio-cultural carrying capacities of the destination"*[39]. Already at the Union for the Mediterranean stakeholder conference "Towards a Roadmap for Blue investment and jobs in the Mediterranean" held in May 2015, in Athens it was recognised that environmental concerns should be factored-in, in order to strike the right balance needed for environmentally-friendly tourism[40].

In addition to preserving nature and biodiversity, sustainable tourism generates economic benefits. These can occur through two main areas: by reducing the costs of tourist facilities through energy, food and water savings, and by creating differentiated market which attracts new type of tourists, whole year long and with higher power purchase.

It should be noted that it is currently **difficult to measure *sustainable* tourism,** i.e. the activities that do not have a negative effect on the environment. In 2015, the **Statistical Framework for Measuring Sustainable Tourism** (MST framework) project started to tackle this issue and is planned to be finalized by 2020. The ambition of this initiative is to develop a statistical framework for the multiple domains of sustainable tourism, to measure the economic dimension of sustainable tourism (GDP and employment) and the environmental impacts. So far, there has been no conclusive discussion on the types of indicators of sustainable tourism that might be defined.[41]

### 2.4.1. Cost reduction through energy savings

One of the best ways for tourist facilities to become more sustainable while decreasing cost and increasing profitability is to revise their **energy consumption**. This s can be done by increasing the use of renewable energy to meet their electricity, heating and cooling needs. This is especially relevant in the coastal Mediterranean areas where solar energy can be captured with photovoltaic or solar thermal panels. Moreover, important cost reductions can be achieved by improving the energy efficiency of buildings and hotels. Such measures foster employment since putting in place energy efficiency solutions requires a local workforce.

[39] UNEP, MAP (2017) Regional action plan on sustainable consumption and production in the Mediterranean, https://wedocs.unep.org/bitstream/handle/20.500.11822/20731/unepmap_SCPAP_eng_web.pdf?sequence=1&isAllowed=y
[40] Union for the Mediterranean (UfM) Stakeholder's Conference „Towards a Roadmap for Blue Investment and Jobs in the Mediterranean", http://ufmsecretariat.org/union-for-the-mediterranean-ufm-stakeholders-conference-towards-a-roadmap-for-blue-investment-and-jobs-in-the-mediterranean/
[41] UNWTO (2016), Measuring Sustainable Tourism: Developing a statistical framework for sustainable tourism, http://cf.cdn.unwto.org/sites/all/files/docpdf/mstoverviewrev1.pdf

To support tourist accommodation, the UNWTO launched the **Hotel Energy Solutions e-toolkit**[42]. This tool enables hotels to assess their current energy efficiency and carbon footprint, and offers them cost-effective energy solutions tailored to the hotel's characteristics, geographical location, available natural resources, etc. Thanks to a return-on-investment-calculator, hotels can evaluate their best investment choices.

Between 2013 and 2016, the European Commission co-financed the project **Nearly Zero Energy Hotels (neZEH)** involving 16 hotels across seven countries, including coastal hotels in Spain, France, Italy, Croatia and Greece. The lessons learned from this project may encourage its replication in other Mediterranean countries. The goal of the project was to drastically decrease the operational costs of hotels by using best practice energy efficiency measures, using renewable energy sources, and changing the behaviour of staff and clients. The results show that on average across the 16 hotels, a **63% reduction** in primary energy use can be achieved[43]. For instance, in the specific case of In the Arkadi Hotel in Chania, Crete, a 114 beds hotel, measures such as installing photovoltaic panels, installing double glazing or replacing incandescent light bulbs with CFL or LED have been implemented. Thanks to these measures, it is forecast that the hotel will **reduce its energy consumption by 70% and cover 50% of its energy use with renewable sources.**

The **project Advance SCP** (Sustainable Consumption and Production) runs in the period 2015-2018 in eight emerging economies including Morocco, where it is implemented by UNEP. In Morocco, the aim of the project is to implement an ecolabel in the tourism sector, specifically for hotels. Ten pilot hotels were graded based on 4 criteria: impact on climate change (kg $CO_2$/person per night), water consumption, non-renewable resources consumption, and percentage of products used that are organic, and locally produced. Hotels receive technical assistance to assess their resource efficiency baseline and to develop action plans. **Savings on water, energy and emissions of more than 20%** in the year following implementation of the program are expected, representing **10% of operating costs**[44]**.**

[42] Hotelenergysolutions.net: http://www.hes-unwto.org/
[43] neZEH, Nearly Zero Energy Hotels in Europe – Flagship projects and tools for hoteliers, http://www.nezeh.eu/assets/media/PDF/D1491.5%20neZEH%20result-oriented%20report.pdf
[44] SCP Clearinghouse, Advance SCP: advancing and measuring sustainable consumption and production for a low-carbon economy in middle-income and newly industrialized countries: http://www.scpclearinghouse.org/initiative/advance-scp-advancing-and-measuring-sustainable-consumption-and-production-scp-low-carbon

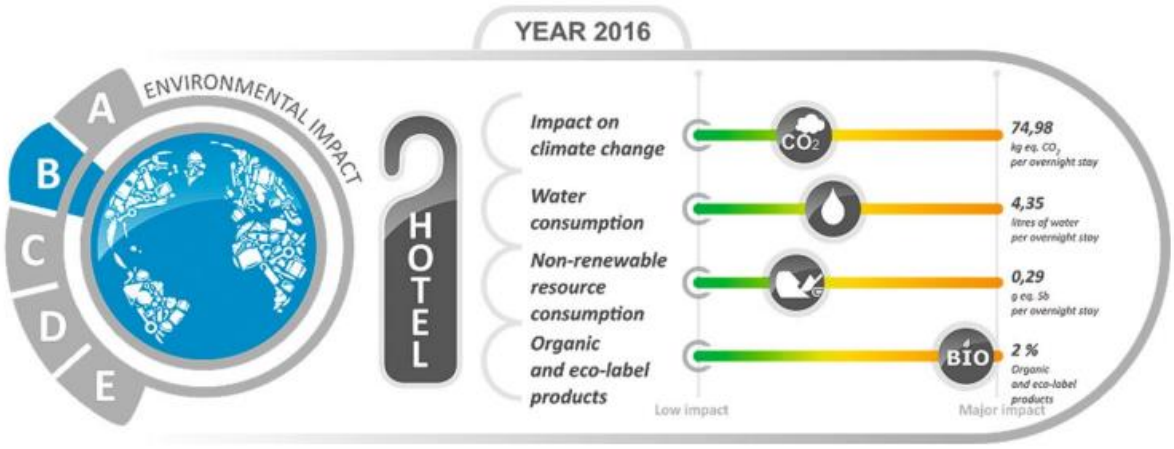


**Figure 6: Example of the environmental impact of a night in Marrakech. Source: GIZ, 2017**

Another recent study surveyed **82 hotels in Albania** on their sustainable tourism practices[45]. In most of the hotels surveyed, energy use and costs limited profitability to a large extent. To counter that, most hotels had implemented several energy-saving measures, especially the use of solar panels for water heating and energy efficient equipment. A high proportion of the hotels employing sustainable tourism practices confirmed that this has enabled them to reduce operational costs: the statement scored on average 5.41 on a scale from 1 (strongly disagree) to 7 (strongly agree). Besides, most hotels believe that by adopting various measures of sustainable tourism practices, their hotel ensures a good future for the tourism industry (mean score of 5.70).

### 2.4.2. Market differentiation and revenue increase

Tourism assets, such as a destination's cultural heritage, landscapes and biodiversity, play an important part in a tourist's destination choice. Preserving the assets of Mediterranean tourism is thus essential in order to keep attracting tourists to the region.

Moreover, the sustainable aspects of a destination or a facility can attract more tourists than non-sustainable ones. Guests can, for instance, choose a hotel because of its "green" initiatives. A survey undertaken in the US found that more than **90% of travellers surveyed said they would choose a "green", environmentally conscious hotel** if the price and amenities were comparable to those at a non-sustainable, non-green hotel[46]. Booking.com also made an international survey in 2015 of 32,000 travellers across 16 countries, and 52% of the respondents reported that they were likely to choose a destination based on its social or environmental impact in 2015[47]. It can be assumed that travellers visiting the Mediterranean region share the same preferences.

[45] Gaspari A. (2015), Albanian hotels and sustainable tourism practices, http://eujournal.org/index.php/esj/article/viewFile/6158/5943

[46] CREST (2013), The Case for Responsible Travel: Trends and Statistics, https://fr.scribd.com/document/311239060/The-Case-for-Responsible-Travel-Trends-and-Statistics-Center

[47] In an international survey by Booking.com in 2015 of 32,000 travellers across 16 countries, and 52% of the respondents reported that they were likely to choose a destination based on its social or environmental impact in 2015. https://globalnews.booking.com/luxury-that-doesnt-cost-the-earth-sustainable-travel-on-the-rise-as-more-travellers-seek-to-reduce-their-carbon-footprint/

Sustainable tourism can also generate higher revenues given the fact that tourists looking for "quality" holidays are likely to be ready to pay more for these services[48]. Mediterranean countries with a nascent tourism industry, may learn from Costa Rica, a recognized example for eco-tourism: between 1986, when ecotourism began to take off and 2007, tourist arrivals in Costa Rica increased seven-fold and tourism revenue fourteen fold; by becoming a leading ecotourism destination, Costa Rica doubled its **earnings per tourist**[49].

To highlight their sustainable performance and thus attract more tourists, tourist facilities can obtain sustainable tourism certifications or labels. Several of these exist, such as the **Travelife Certification**, officially recognized by the **Global Sustainable Tourism Council**[50]. To receive this certification, hotels must undertake an independent on-site audit to prove they meet strict criteria such as "*an energy and emissions management plan with quantitative goals"*[51]. Several Mediterranean infrastructures have received the certification, for instance in **Tunisia** (e.g. Magic Life Penelope Beach Imperial in Djerba, or the Manar Magic Hotel in Hammamet) or in **Turkey** (e.g. Sentido Flora Garden in Antalya or Grand Yazici Club Turban Hotel in Marmaris).

Another interesting initiative is the **Green Key**[52], a voluntary eco-label awarded to more than 2600 hotels, hostels, small-scale accommodation, campsites, restaurants and attractions in 56 countries including **Morocco, Tunisia, Egypt, Israel and Lebanon**. Establishments can receive this label only if their premises adhere to the strict criteria set by the Foundation for Environmental Education. Other international labels include Green Globe 21, Green Leaf, ECEAT, Eco Camping, Eco certified Ecotourism, Green Deal, Ecotel certification, Green Star Hotel, Green Flag Award, etc.

Another Mediterranean initiative is the project **ShMILE 2**, carried out between 2012 and 2014 involving eleven organizations from six countries (Tunisia, Egypt, Jordan, Greece, Italy and France) which received training and support tools to be able to create new markets for sustainable tourism. According to the program, **eco-certified accommodation is more competitive**, thus increasing the occupancy rate. Moreover, it states that 22% of eco-certified accommodation noticed an **increase in customers loyalty**[53].

[48] However, eco-conscious consumers tend to travel more frequently than average consumers. https://www.scribd.com/document/311239060/The-Case-for-Responsible-Travel-Trends-and-Statistics-Center

[49] CREST (2013), The Case for Responsible Travel: Trends and Statistics, https://fr.scribd.com/document/311239060/The-Case-for-Responsible-Travel-Trends-and-Statistics-Center, based on government statistics from the Costa Rican Tourism Institute

[50] The Global Sustainable Tourism Council (GSTC) integrates UN agencies, NGO's, governments, travel companies, hotels, tour operators, individuals and communities –striving to achieve best practices in sustainable tourism. It manages global sustainable standards. https://www.gstcouncil.org/about/about-us/

[51] Travelife Sustainability System for Accommodations Standard – Type I, http://www.travelife.org/Hotels/documents/TL_standards.pdf

[52] http://www.greenkey.global/

[53] ShMILE 2, The Benefits of the European Ecolabel, http://www.shmile2.eu/public/docs/2/116.pdf

### 2.4.3. Other potential benefits

It is interesting to note that the revenues generated in the sustainable tourism sector are better distributed than in the case of mainstream tourism. A 2011 UN-supported study by the **Collaborative Partnership on Forests**[54] showed that ecotourism can return up to **95% of revenues to the local economy**. This compares to only about 20% for "standard all-inclusive package tours" where most of travellers' expenditure goes to airlines, hotels or other international companies, but not to local businesses or workers[55].

**Local incomes** generated by the development of national parks, nature reserves or marine protected areas in the Mediterranean countries can be reinvested in the restoration and protection of vulnerable ecosystems, and thus contribute to nature and biodiversity conservation. This helps the creation of more qualified jobs and contributes to territorial development.

## 2.5. Outlook

### 2.5.1. Expected trends

The number of **international tourists** in Mediterranean countries has been steadily rising in the last decades in the Mediterranean countries: growing from 58 million international tourist arrivals (ITAs) in 1970 to nearly 314 million in 2014[56], and the region was expected to attract 355 million ITAs in 2016[57]. Note that this includes the numbers for the entire countries, not just the coastal areas which received about half of those ITAs. Forecasts expect the number to continue to grow, and reach 500 million in 2030, meaning potentially 250 million international tourists in coastal areas – in addition to the domestic tourists.

[54] UN News Centre (2011), Ecotourism boom can help save endangered forests, UN and partner say, http://www.un.org/apps/news/story.asp?NewsID=39865#.WgCnCXle5Ms
[55] Shapley D. (2011), Ecotourism has Significant Benefits, The Daily Green, http://preview.www.thedailygreen.com/environmental-news/latest/ecotourism-benefits-0911
[56] UNEP, MAP, Plan Bleu (2016), Tourism and sustainability in the Mediterranean: key facts and trends, http://planbleu.org/sites/default/files/publications/tourism_and_sustainability_june2016.pdf
[57] WTTC (2016), Travel & Tourism – Economic impact 2016 Mediterranean

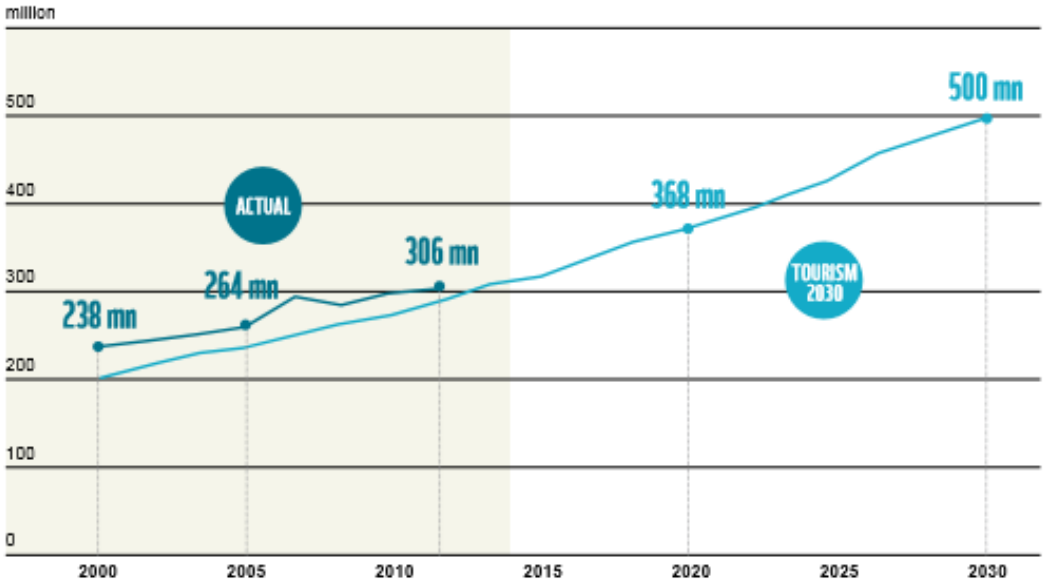


**Figure 7: Expected trends of international tourist arrivals in the Med region, in million (WWF, UNWTO)**

Moreover, the environmental impacts of tourism can contribute to climate change, which can in turn negatively affect the tourist sector, due to increased heat stress, wildfires, frequency of infectious diseases or insect/water-borne pests (jelly fish, algae blooms), extreme storms, flooding or disappearance of beaches through sea level rise. Under the current economic conditions, it is estimated that **climate change could cut tourism revenues by up to 0.45% of GDP/year** in the Mediterranean EU countries[58]. A study analysing the economic impact of climate change on tourism in eleven Mediterranean SEMC found that these countries could experience a decline in GDP ranging from -0.09% to -0.24% depending on the scenario in 2050; according to this study, the highest losses would be experienced by Morocco and Tunisia[59].

As discussed previously, developing sustainable tourism could **preserve landscapes and biodiversity**, decrease water and air pollution as well as the pressure on natural resources. Moreover, it would generate additional economic benefits that would be more evenly distributed to the local economy, and create additional, better paid jobs. It may also contribute to preserving **the local identity and physical appearance of coastal cities**.

[58] Barrios S., Ibanez Rivas J. (2015), Time is of the essence : adaptation of tourism demand to climate change in Europe, CLIMATIC CHANGE p. 645-660 no. 4 vol. 132 https://ec.europa.eu/jrc/en/publication/time-essence-adaptation-tourism-demand-climate-change-europe

[59] MedPro (2013), Economic Impacts of Climate Change in the Southern Mediterranean, https://www.ceps.eu/system/files/MEDPRO%20TR25.pdf

**Developing low season tourism**

In the Mediterranean area, tourist flows are concentrated during the summer months (especially July and August). This has negative impacts in terms of employment, but also in terms of stress on the environment (congestion of natural areas, disturbance of wildlife, exhaustion of natural resources etc.) and saturation of infrastructures (airport, trains, roads, energy and water supply, etc). Tackling the seasonality issue by extending tourism during the low and medium season could thus create more and better jobs in the tourism sector, and reduce peak pressure on the environment[60].

Developing specific offers for groups that can travel easily during the low season, such as seniors and young people can help. In fact, there are 128 million senior citizens (over 55 years old) in Europe, about a quarter of the population[61]. This group represents an important market potential as they usually have a relatively high purchasing power and long leisure time. Young people (aged between 15 and 29) represent 96 million people in Europe, one fifth of the population.

The **Seniors on Reciprocal Tourism (SORT) project** involves 8 EU partners from South Eastern Europe, including coastal areas of Greece, Croatia and Italy and focuses on the enhancement of the competitiveness and sustainable growth of Senior tourism. It created the prototype SORT model, a 10-day touristic program based on the needs and desires of seniors above 55, combining touristic and voluntary activities. Seven successful pilot applications took place in October and November 2016[62]. Such schemes could be replicated in other Mediterranean countries.


## 2.5.2. Critical issues

The development of tourism in general, and sustainable tourism specifically, can be influenced by several factors:

- **Public policies and regulation:** Policies and regulation, at local, national or regional level, are essential to support the development of sustainable tourism (i.e. through sustainable destination management, environmental taxes, climate and biodiversity plans, etc.). For the Mediterranean region, a set of strategic guidelines have been developed with specific recommendations to develop a more sustainable tourism[63]. For example, the tourism tax, implemented by several Mediterranean countries (at local, regional or national level) can raise funds to invest in greening the tourism industry and compensate negative externalities.

[60] However, it should also be noted that year-around-tourism activities might not allow flora and fauna to recover.
[61] European Commission, Low season tourism, http://ec.europa.eu/growth/sectors/tourism/offer/seniors-youth_fr
[62] See the SORT guide: http://sort.mentores.eu/wp-content/uploads/2017/10/SORT-Guide-EN.pdf
[63] Fosse, J. & Le Tellier, J. (2017). Sustainable Tourism in the Mediterranean: State of Play and Strategic Directions, http://planbleu.org/sites/default/files/publications/cahier17_tourisme_en_web.pdf

- **Access to finance:** Green tourist facilities need to have access to financing to develop their sustainable offer. Several sources of funds are available from international public donors (World Bank, UNDP, GEF, etc.), and other international funds (UNWTO 10YFP Sustainable Tourism Programme, EC COSME Programme, etc.). In **Morocco** for instance, the tourism and economic and finance ministries decided to launch in 2003 the **Renovotel program**, an investment fund, dedicated to upgrading touristic accommodations (hotels, guesthouses). The goal of this initiative is to renovate buildings, taking into account environmental considerations.
- **State of the economy:** An economic recession, by decreasing the purchasing power of the potential travellers, can hinder the development of tourism, and therefore also of sustainable tourism. This was seen during the 2007-2008 financial crisis, when tourism related employment in the Mediterranean countries decreased by 12% [64].
- **Security and stability:** Security concerns affect a traveller's choice of destination and can hinder or foster tourism and thus sustainable tourism in the region. SEMC especially suffer from this. For instance, **ITAs in Turkey** decreased for the first time in 2015, due to terrorism threats, geopolitical tensions and social protests. Similarly, in 2015 **Tunisia** lost more than a third of its tourism revenue compared to 2014, which represents more than 2% of its GDP[65]. On the other hand, due to the "connected vessels effect", similar destinations in Northern Mediterranean such as Spain attract an increasing number of tourists (+ 7% of tourists in 2014).
- **Travel and mobility patterns:** Tourism is a highly dynamic industry with expected further expansion of Low Cost Carriers and the opportunity to target new middle-class travellers from emerging countries[66]; the increasing use of mobile phones and applications for travel that facilitates real time information, bookings and payments; seamless travel (using a variety of modes of transportation organised through a single booking process or ticket, facilitating the logistics of the journey); and the potential growth of business travel[67] (especially in the context of globalisation and the rise of emerging markets).
- **Resilience to Climate change and other environmental issues:** The impact of climate change is particularly relevant in the Mediterranean coastal area, with the rise of sea level, higher frequency of natural events (floods, fire), increase in biodiversity losses, among other consequences. The capacity of natural and human eco-systems to mitigate and adapt to those threats is essential to maintain a successful tourism industry highly depending on healthy natural assets[68]. In this environmental scenario, sustainable tourism is both a necessity and opportunity.

For these reasons, it is difficult to predict future developments, even though there is a shared consensus on the rise of tourism activities globally, regionally and locally. However, active policies can increase the share of sustainable tourism under all possible scenarios.

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[64] Eco-Union (2017), Strategic guidelines for a Blue Economy in the Mediterranean

[65] UNEP, MAP, Plan Bleu (2016), Tourism and sustainability in the Mediterranean: key facts and trends, http://planbleu.org/sites/default/files/publications/tourism_and_sustainability_june2016.pdf

[66] Oxford Economics (2014), Shaping the future of travel: macro trends driving industry growth over the next decade, http://www.amadeus.com/documents/Thought-leadership-reports/Amadeus-Shaping-the-Future-of-Travel-MacroTrends-Report.pdf

[67] Ibid.

[68] Randone. et al. (2017), Reviving the Economy of the Mediterranean Sea, WWF

# Fisheries and Aquaculture in the context of Blue Economy

## 3.1. Overview

The world's fisheries and aquaculture industry is faced with the challenge of meeting a **growing demand**, driven by population growth, in a context where **environmental pressure and social imbalances** are becoming more and more serious. **SDG 14**, "Life below water"[69], sets targets for the contribution of fisheries and aquaculture to food security and nutrition in order to ensure sustainable economic, social and environmental benefits.

On a global level, catches in the fisheries sector have remained basically steady over the past three decades, while the rapid growth of aquaculture has allowed increased production of fish resources: whereas aquaculture provided only 7 % of the fish for human consumption in 1974, this share had increased to 50 % by 2014[70].

The issue of **sustainable management of fish stocks** remains unsolved even though there are many international initiatives that provide guidance on how to balance food security, economic growth and social development through the sustainable management of ocean resources. In particular, **SDG 14** includes specific targets concerning sustainability of fisheries resources:

- **Target 14.4**: by 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics.
- **Target 14.6**: by 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, eliminate subsidies that contribute to illegal, unreported and unregulated fishing and refrain from introducing new such subsidies (…).
- **Target 14.9**: provide access for small-scale artisanal fishers to marine resources and markets.

The **Food and Agriculture Organization** (FAO) is an important global player in the process of implementing sustainable fisheries and aquaculture. **FAO's Blue Growth Initiative**[71] helps develop the new global fisheries and aquaculture program through the implementation of the **Code of Conduct for Responsible Fisheries**, adopted by 170 countries around the world. Reflecting on the SDG targets, it addresses in particular the many vulnerable coastal communities, where ecosystems are already under stress by pollution, habitat degradation, overfishing and harmful practices. **The Ecosystem Approach to Fisheries**

[69] Sustainable Development Goal 14: http://www.un.org/sustainabledevelopment/oceans/
[70] FAO (2016), The State of World Fisheries and Aquaculture 2016, http://www.fao.org/fishery/sofia/en
[71] FAO – Blue Growth: http://www.fao.org/policy-support/policy-themes/blue-growth/en/

**(EAF) and Aquaculture (EAA)** are relevant strategies to enhance adoption and implementation of the FAO guidelines.

In **the Mediterranean region**, many institutional initiatives aimed at sustainable development of the fisheries and aquaculture sector can be highlighted.

The **EU Common Fisheries Policy (CFP)** is a set of rules for managing European fishing fleets and for conserving fish stocks. It includes several policy areas, including fisheries management, international policy, market and trade policy, funding of the policy (through the European Maritime and Fisheries Fund -EMFF)[72]. Important calls for action, such as the recent **Malta MedFish4Ever Declaration[73],** started from European Union initiatives.

An important attempt to tailor SDG 14 to the needs and specificities of the Mediterranean is the **General Fisheries Commission for the Mediterranean (GFCM) mid-term strategy (2017–2020)** towards the sustainability of Mediterranean and Black Sea fisheries[74]. The mid-term strategy is the fruit of the commitment of the GFCM contracting parties, as well as cooperating non-contracting parties and partner organizations to improve, by 2020, the sustainability of Mediterranean and Black Sea fisheries and ensure that the alarming trend in the status of commercially exploited stocks is reversed.

Managing fishery resources in a sustainable way is a challenge, but also an opportunity to develop a Blue Economy that creates **new job opportunities and socio-economic benefits** for the community[75].

## 3.2. Current status of fisheries

With EUR 4.1 billion of GVA and 353.000 direct jobs created, the fisheries and aquaculture industry in the Mediterranean Sea is **the third most important Blue Economy sector** in socio-economic terms after tourism and maritime transport[76].

To date, fisheries account for about 60% of the total value of the sector, while aquaculture is about 40%. Growth prospects indicate that aquaculture may soon overtake fisheries in terms of value.[77]

[72] European Commission – The Common Fisheries Policy: https://ec.europa.eu/fisheries/cfp_en
[73] Ministerial Conference on the Sustainability of Mediterranean Fisheries (2017), Malta MedFish4ever Ministerial Declaration, https://ec.europa.eu/fisheries/sites/fisheries/files/2017-03-30-declaration-malta.pdf
[74] General Fisheries Commission for the Mediterranean (GFCM): http://www.fao.org/gfcm/activities/fisheries/mid-term-strategy/en/
[75] See also findings of 41st Annual Session of the General Fisheries Commission for the Mediterranean: "Making change happen in the Med and Black Sea" (16 Oct 2017), https://ec.europa.eu/maritimeaffairs/content/41st-annual-session-general-fisheries-commission-mediterranean-making-change-happen-med-and_en
[76] Plan Bleu (2015), Economic and social analysis of the uses of the coastal and marine waters in the Mediterranean, https://planbleu.org/sites/default/files/publications/esa_ven_en.pdf
[77] FAO (2016), The State of World Fisheries and Aquaculture

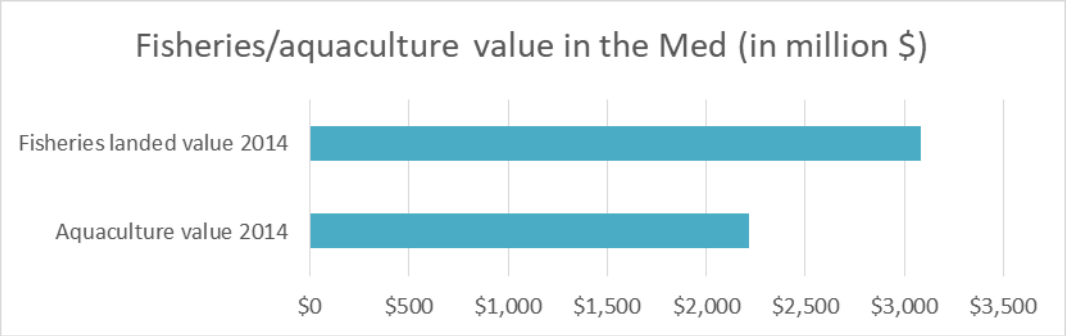



**Figure 8: Fisheries and aquaculture value in the Mediterranean (in million USD) elaboration on FAO, 2016**

The Mediterranean Sea is characterized by a high biodiversity, with a large number of fish species and the absence of large mono-species stocks. The need to protect such a complex and varied ecosystem, while maintaining and implementing the economic opportunities linked to the use of marine resources, forces the fishing industry to face the enormous challenge of **environmental, social and economic sustainability**.

The work of international institutions and national governments in the Mediterranean, with extensive involvement of various stakeholders, is leading to the implementation of strategies for the sustainable management of fish resources. A good example of common strategies is provided by **EU Strategy for the Adriatic and Ionian region (EUSAIR)**[78], which involves several States in coordinated actions to promote a Blue Economy (see Box below). There have been two recent calls for action on biodiversity in the Mediterranean: the **Tangier Declaration** to scale-up the **Marine Protected Area Roadmap**[79] and the **MEDFISH4EVER Malta Conference Declaration**[80], calling for specific actions to recover fish stocks and marine ecosystems.

### 3.2.1. The fishing fleet

There are about **82.000 fishing vessels**[81] operating in the Mediterranean, of which approximately **80% are small-scale vessels** (up to 12 meters in length overall- LOA). Besides being the most numerous, the small-scale fleet segment employs the **highest number of fishermen**.

Fishing methods that use large nets for bottom and mid-water trawling, dredging, gillnetting (curtains of nets suspended in the water) or purse seining (with fish aggregating devices) and longlining (with tens of kilometres of long lines) lead to significant amounts of bycatch, death of other animals such as sea turtles or birds, and destruction of the seafloor habitat. The use, instead of hook-and-line methods (trolling), jigging or traps and pots allow much more selective fishing with less impact.[82]

However, the fishing methods that are largely deployed in the Mediterranean today are unsustainable: in terms of **total landings** by weight, **large purse seiners (> 12 m LOA)** are the most important fleet segment; while in terms of **landing value, medium to large trawlers (> 12 m LOA) are** the leading segment.

[78] EU Strategy for the Adriactic and Ionian region (EUSAIR): http://www.adriatic-ionian.eu/
[79] Tangier declaration: http://www.medmpaforum.org/sites/default/files/tangier_declaration.pdf
[80] European Commission (2017), Malta Medfish4ever Declaration Strengthening Fisheries Governance in the Mediterranean, https://ec.europa.eu/fisheries/sites/fisheries/files/2017-03-30-declaration-malta.pdf
[81] FAO, GFCM (2016), The State of. Mediterranean and Black Sea Fisheries 2016, http://www.fao.org/gfcm/activities/fisheries/mid-term-strategy/en/
[82] Seafood Watch – Fishing & Farming Methods: http://www.seafoodwatch.org/ocean-issues/fishing-and-farming-methods

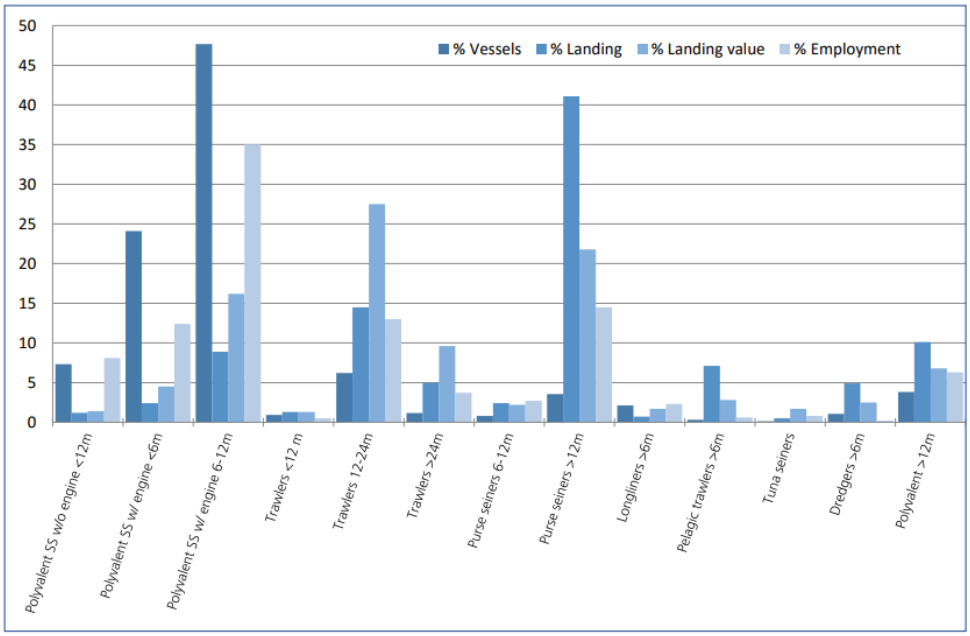



**Figure 9: Relative importance of GFCM fleet segment in terms of fishing vessels, landings, landings value and employment (FAO, GFCM,2016)[83]**

[83] Data also include vessels operating in the Black Sea, which account for 12% of the total.

The vessel types deployed in the Mediterranean are shown in the following pictures:

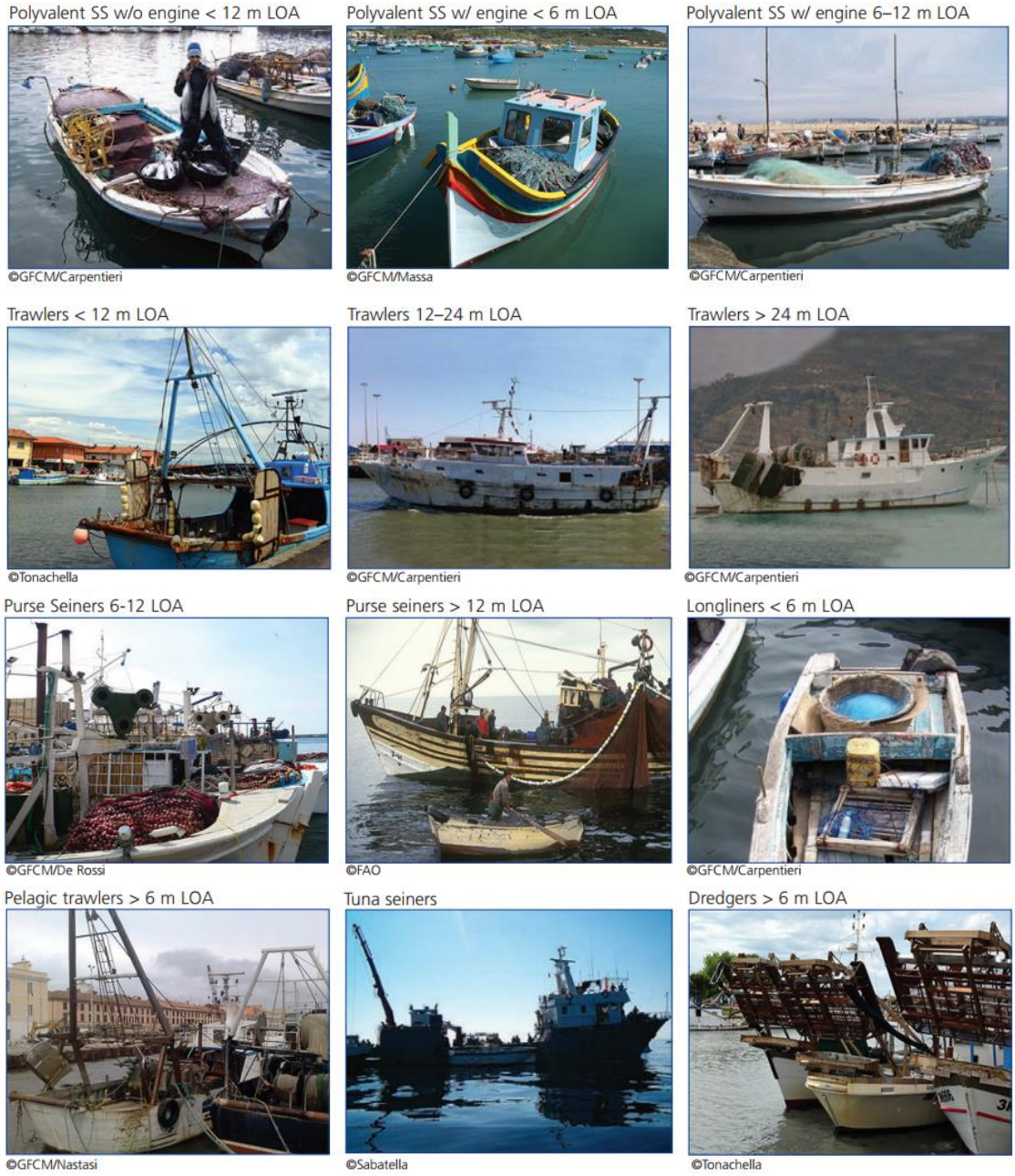



**Figure 10: Examples of Mediterranean vessels (FAO, 2016)**

A move towards sustainable fishing practices will require a combined effort by policy makers, the fishing industry and the consumer, together with financial support for fishermen and higher prices for fish and sea food.

## 3.2.2. Landed value of fisheries

Landed value means total landed catch multiplied by the estimated ex-vessel price, i.e. the price a fisherman realizes upon sale of their catch at the first point of sale. The total value of fish landings across the Mediterranean is estimated to be a **minimum of USD 3.08 billion** (FAO 2016)[84]. The sub-region with the highest landing value is the Western Mediterranean, followed by the Ionian Sea.

Five countries account for approximately 80 % of the total landing value of Mediterranean fisheries: Italy (USD 1.500 million), Greece (USD 950), Spain (USD 950), Turkey (USD 450) and Algeria (USD 300).[85]

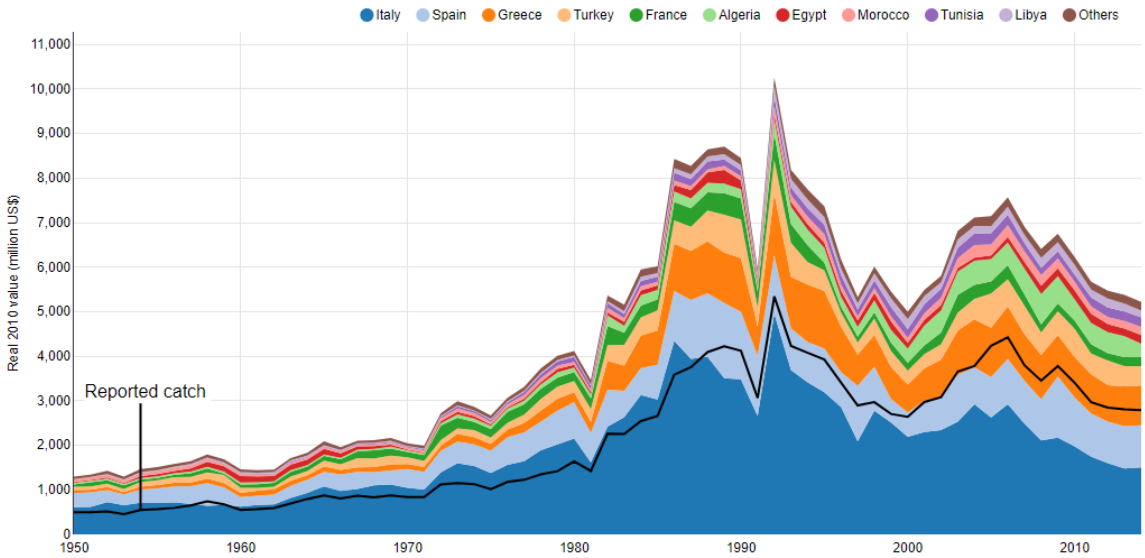



**Figure 11: Landed value (Seaaroundus, 2017)**

The landed value reached its peak in the early 1990s and again in the mid-2000s but has been in decline since 2006.

[84] In terms of direct GVA, this corresponds to about 2.2 billion euro (Plan Bleu, 2015)

[85] Based on the landed value, it is possible to estimate the contribution to GDP of the industry using the multiplier estimated by Dyck and Sumaila (2010), averaging at 2.65. As previously mentioned, Seaaroundus data also takes into account those parts of the catch that are unreported, thought an estimation method.

## 3.2.3. Fisheries employment

According to GFCM data, **220.000 fishermen** are directly employed in the Mediterranean[86]. This includes only direct employment, excluding indirect jobs that are highly dependent on the fishing industry (fish processing, fish marketing or boat maintenance), and which may account for as much as half of total employment in the fisheries sector[87]. The region with most employment is the Ionian Sea (144,000), followed by the Eastern Mediterranean (98,329), Western Mediterranean (36,382) and Adriatic Sea (35,523).

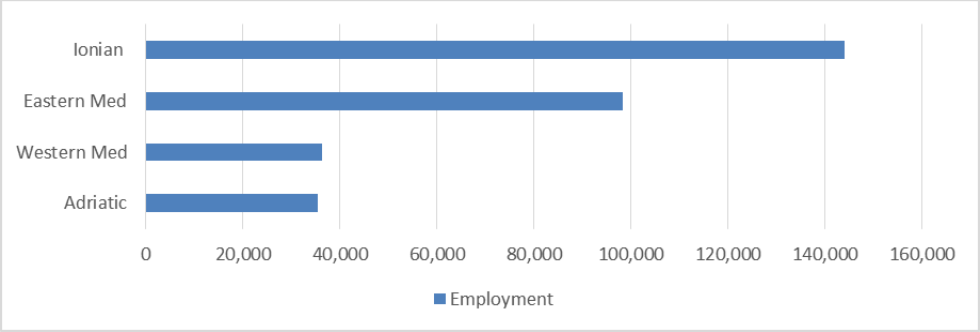



**Figure 12: Total employment by region (GFCM, FAO, 2016)**

According to OECD data (2013), countries leading employment in Mediterranean fisheries are **Tunisia** (51,350 persons), **Greece** (42,962), **Italy** (26,758) and **Libya** (25,552).

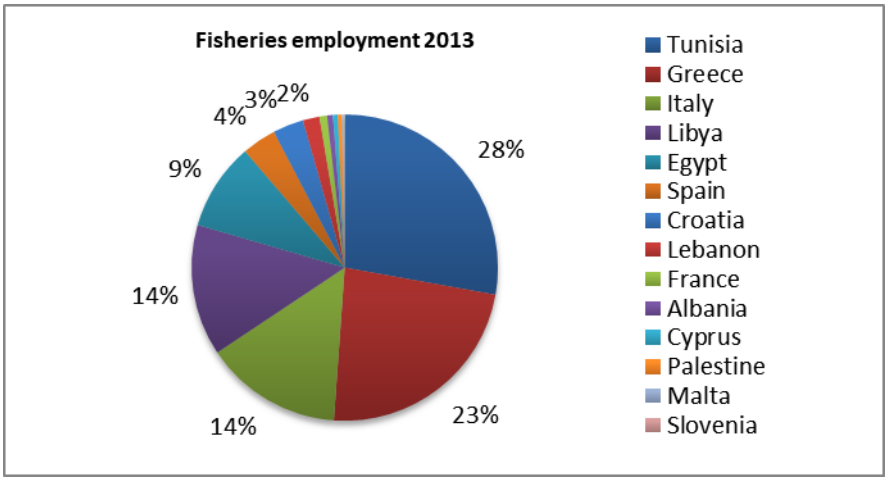



**Figure 13: Employment in fisheries by country (OECD)**

The sector has suffered a significant **decline in jobs over the past decades** (in 1995 there were 377.705 fishermen in the Mediterranean). The greatest loss of employment was recorded in Croatia (falling from 49,991 fishermen in 1995 to 5,987 in 2013), Lebanon (from 9,825 to 3,228) and Italy (from 45,000 to 26,758).

[86] GFCM and FAO, 2016. Note that this number does not include aquaculture.
[87] Sauzade D., Rousset N. (2013). Greening the Mediterranean fisheries: tentative assessment of the economic leeway. Plan Bleu, Valbonne

## 3.2.4. The role of small-scale fisheries

Artisanal and small-scale fishing (SSF) in the Mediterranean plays a **significant social and economic role**: they represent more than **80% of the fishing fleet,** occupy at least **60% of those workers** directly engaged in fishing activities, but only represent roughly 20% of the total landing value from fishing catch (the industry is characterized by a high labour-intensity). The role of SSF fishing is of fundamental importance for a strategy aimed at sustainable high-quality fisheries, which, through careful selection of the species caught and techniques used, results in high economic value, reduced pressure on stocks (reducing bycatches, reducing catches of specimens too young, see figure below) and in a direct return to the communities involved, in terms of direct and indirect employment.


**Figure** 14**: The greater selectivity of artisanal fishing - FAO, GFCM (2017)**[88]

To manage development within the industry, the GFMC provides a **regional platform** where the main recurring issues related to small-scale fishing can be discussed and addressed by all stakeholders. It has shown widespread interest in ensuring sustainable small-scale fishing consistent with the FAO Code of Conduct for Responsible Fishing[89]. The fundamental priorities for the industry include the need for stronger political commitment, intergovernmental cooperation and technical assistance. Other essential prerequisites are a well-established knowledge base, better data collection and analysis, and the development of integrated management and co-management mechanisms with environmental targets, including marine protected areas (MPAs).

Although sustainable fishing models of small-scale and artisanal fisheries require greater labour intensity, they may not be able to offset the loss of jobs due to declining fish stocks. Only if stocks are given space and time to recover and then sustainably managed**,** new employment opportunities may be developed in research, technological innovation, eco-efficient management and product certification, accompanied by a high economic value of the product.

[88] Trawl fishery catches more small fish that have not matured yet (x-axis: length in cm; y-axis number of fish caught). Note that gill nets can accidentally entangle and kill other animals.
[89] FAO Code of Conduct for Responsible Fishing: http://www.fao.org/docrep/005/v9878e/v9878e00.HTM

## 3.3. Challenges of fisheries

According to FAO data, the total catch volume in the Mediterranean reached **about 787 000 tonnes** in 2013[90] (less than 1% of the of 92.7 tonnes caught in the world that year). Another estimation made by SeaAroundUs[91], a research initiative by The University of British Columbia, calculates a higher amount taking into account also the volume caught but not reported in the official data (**unreported catch**). The study, which in addition to official FAO data also provides an estimate of the amount of accidental catches, fish discarded at sea, recreational and subsistence fishing and illegal fishing, shows a total catch volume of some **1.6 million tonnes in 2014** (figure below).

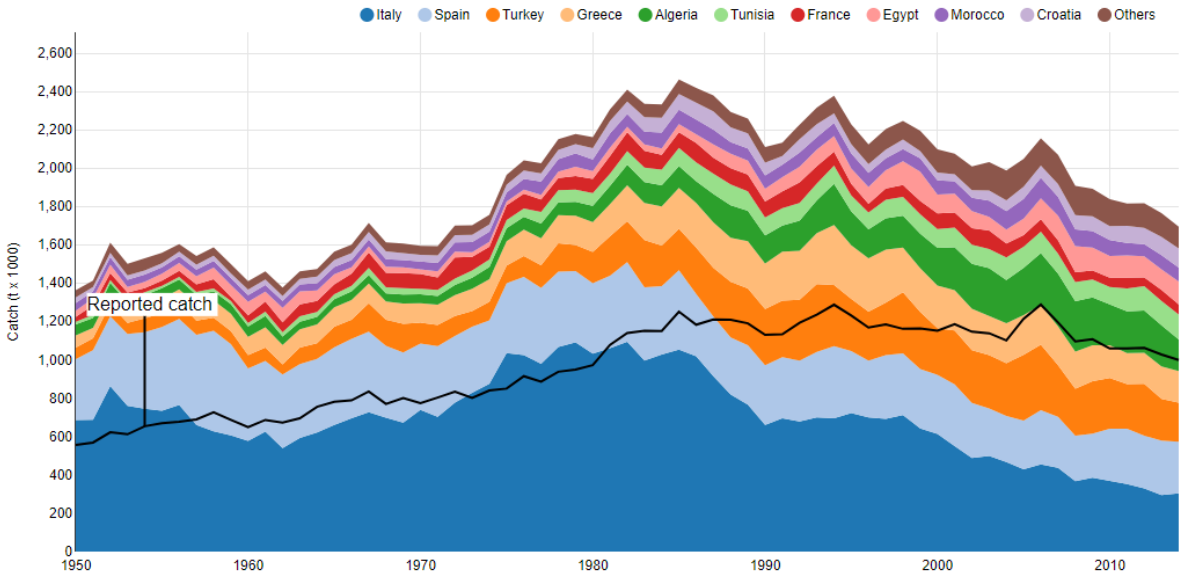



**Figure 15: Amount of fish caught by Mediterranean countries in 2017 (SeaAroundUs)**

A substantial **decrease since 2006** can be observed, primarily due to excessive pressure on stocks over the past few decades. According to FAO (2016), "*the situation in the Mediterranean is alarming*". Approximately **80% of Mediterranean stocks** are estimated to be fished at above biologically sustainable levels[92]. The fishing pressure in the Mediterranean Sea shows a fishing mortality rate that is on average 5 times higher than the target and for some specific stocks, up to 12 times higher than the biologically sustainable level. Fish stocks and biodiversity in many areas of the Mediterranean are in a particularly critical situation due to the excessive pressure exerted by fishing.

[90] FAO (2016), The State of Mediterranean and Black Sea Fisheries 2016, http://www.fao.org/3/a-i5496e.pdf
[91] SeaAroundUs: http://www.seaaroundus.org/
[92] Based on the FAO classification on the status of stocks, biologically unsustainable levels imply that either fishing mortality is higher than the target fishing mortality, or that biomass is lower than the target biomass level.

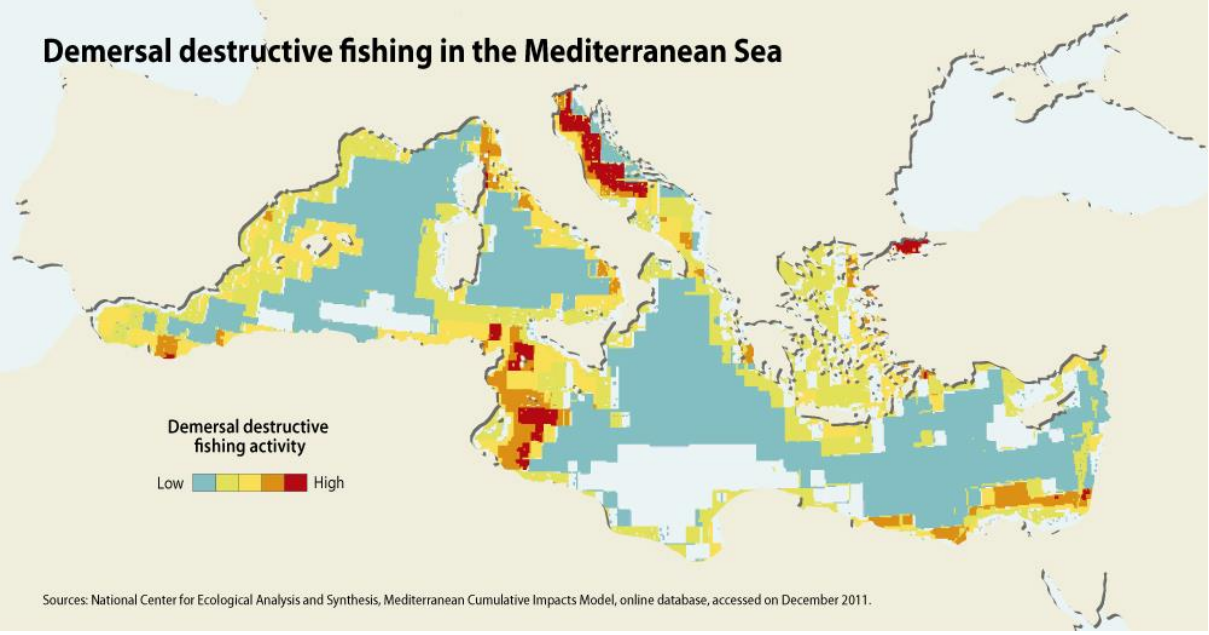



**Figure 16: Demersal destructive fishing in the Mediterranean Sea (GRID-Arendal, 2013)**

FAO highlights the urgent need to invest in sustainable management of fishery resources by developing high quality fisheries and high added value, in the overall context of a reduction in catches.

It is also interesting to note that there has been a convergence between reported and unreported catch due to the improvement of reporting and control tools on fishing. The structure of the economic sector shows a prevalence of industrial fishing (about 60% of fish caught), but a significant role is also borne by the artisanal fishing sector (some 30%):

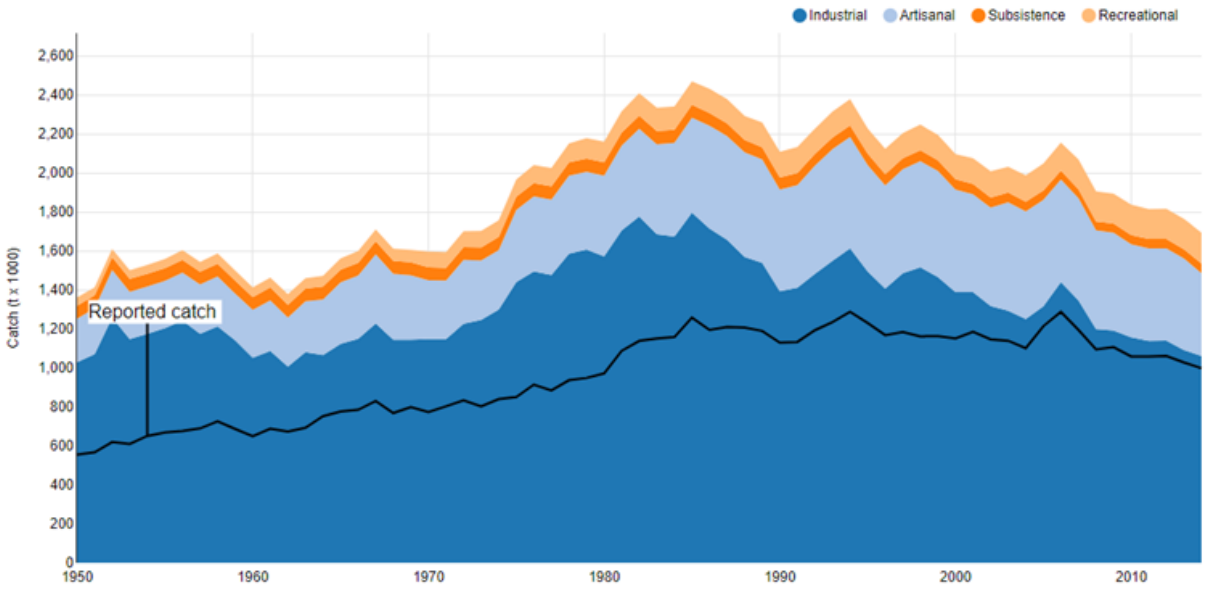



**Figure 17: Amount caught in the Mediterranean per fishing sector (Searoundus, 2017)**

*Good practice in sustainable fishery*

## R.E.A.D.Y. MED. FISH - Requalification of Employment and Diversification for Youth in the Mediterranean Fisheries Sector

*ENPI CBC Med programme, Italy, Tunisia, Egypt and Lebanon*

**DESCRIPTION**

To stop the trend of declining employment in the fisheries sector, employment opportunities can no longer be limited to fishery activities in the strict sense of the term, but have to be part of a far-reaching diversification and reconversion of the fishery sector. This can be achieved through starting up multifunctional activities such as fishing tourism, ichthyo-tourism, management of environmental services by fishermen and alternative forms of valorisation of the sector also through tourism and socio-educational activities. In this context, the 1.5 m€ project R.E.A.D.Y.MED.FISH involved public institutions and private partners in four Mediterranean countries (Italy, Tunisia, Egypt and Lebanon). It aimed at enhancing the professionalization of young fishery operators and to train the officers of public administrations and fishery associations in order to boost the private entrepreneurship and the normative improvement in the framework of the fishery sector multi-functionality.

**RESULTS:**

- New professional profiles and business opportunities for the diversification of fishermen's income defined
- Enhanced professional and entrepreneurial skills of 80 young fishermen
- Capacities of 40 operators from public administrations and fishery associations reinforced in order to support the start-up of new businesses by young fishermen
- Support services delivered to fishermen through the creation of information and assistance desks
- Number of young fishermen carrying out complementary activities for income diversification increased by 15% in the communities involved
- Reduced impact of commercial fisheries on marine ecosystems

*Source: www.readymedfish.eu*

## 3.4. Current status of aquaculture

Despite the steady decrease in Mediterranean captures in the last decades, the total value of the fish industry (fisheries and aquaculture) has increased because of the **fast development of aquaculture**[93]. Aquaculture encompasses the breeding of many aquatic species, in different natural environments such as sea, rivers and lakes, or artificially aquatic environments[94]. Although traditional aquaculture has been practiced for thousands of years in the Mediterranean, modern aquaculture started in the 1970s. From 1994 to 2014 **the value of the Mediterranean aquaculture grew by more than 250%**, counterbalancing the decline in fisheries. Over the same period, aquaculture production in the region grew from 200,000 to 445,000 tons.

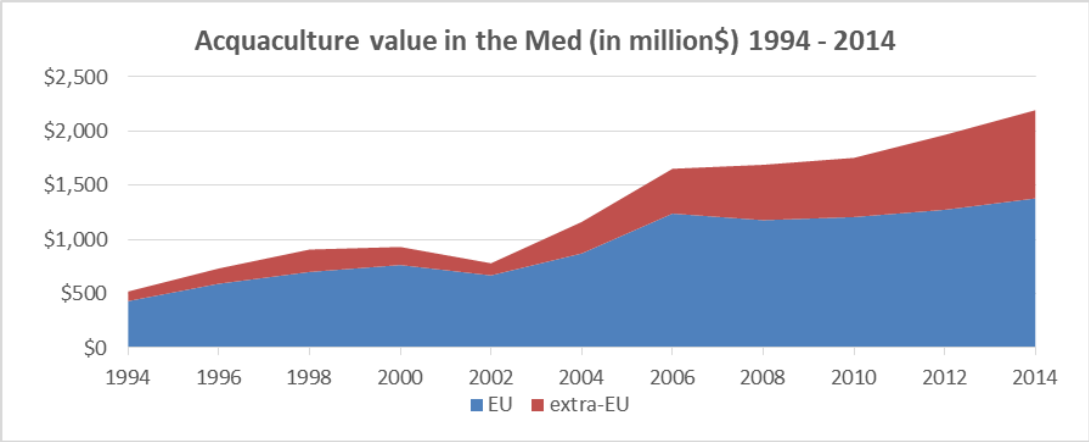



**Figure** 18: **Aquaculture value in the Mediterranean region, elaboration on FAO, 2016**

**Significant growth** has also occurred **in non-EU countries**, where aquaculture practices started to develop later.

The growth trend in aquaculture has led to an increase in the number of **direct jobs reaching 120,000**, and even 750,000 if indirect jobs across the entire value chain are considered (Sacchi, 2011).

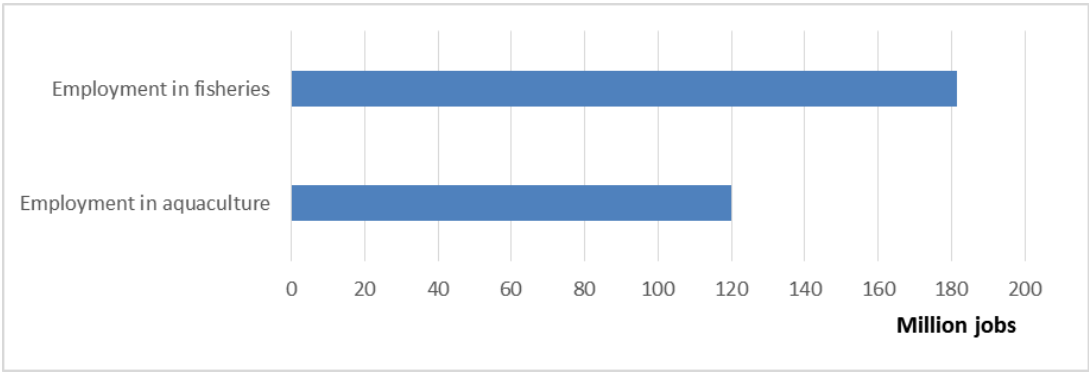



**Figure** 19: **Employment in aquaculture and fisheries in the Med, Elaboration on FAO (2016), Sacchi (2011)**

[93] According to FAO data, without considering the Seaaroundus extra-estimation on Med catch

[94] We focus on the analysis of marine aquaculture data (Maricolture), which accounts for more than 70% of the total in the Mediterranean countries (Plan Bleu 2015).

## 3.5. Challenges of aquaculture

In some cases, rapid development and expansion of intensive aquaculture can result in degradation of the environment due to eutrophication, use of antibiotics and escaped fish. Intensive farming in open net pens or cages has negative effects similar to industrial farming of land-based animals, such as contamination through excrements released into the environment, high amounts of feed needed, use of antibiotics, spreading of diseases and parasites, reduced biodiversity in the proximity of the farms, stress and suffering of the animals, etc. In addition, non-native species can escape, or genetically weaker hatchery fish may interbreed with wild populations, compromising their resistance.[95]

Unsustainable aquaculture can also negatively impact the food supply and food security of coastal communities as fish caught is used in fishmeal for aquaculture. Fish farms often block previously freely accessible land and sea areas that were used by local people for fishing.

In order to cope with the pressure exerted on ecosystem resources and to provide an alternative source of marine production**, aquaculture practices must be sustainable, and respect the ecosystems and communities** in which they are located. A sustainable aquaculture model invests in **technologies and practices** that combine an increase in production and positive employment effects with a low impact on the marine ecosystem.

According to FAO analysis[96], several certification programs have made progress in defining the key characteristics of sustainable aquaculture. Sustainable aquaculture that would contribute to the development of the Blue Economy in the Mediterranean can be achieved through **environment practices**, such as water quality control and minimization of biodiversity impact (e.g. through recirculating systems for raising fish in tanks), **community practices**, such as well-defined rights on aquaculture zones, fair labour practices, and **sustainable farm management practices**, such as minimal antibiotic and pharmaceutical use[97].

[95] Seafood Watch – Fishing & Farming Methods: http://www.seafoodwatch.org/ocean-issues/fishing-and-farming-methods
[96] GFCM (2013), Indicators for sustainable aquaculture in Mediterranean and Black Sea Countries, http://www.fao.org/3/a-i5496e.pdf
[97] A reference point for sustainable aquaculture is provided by **FAO ecosystem approach to aquaculture (EAA)**, that is "a strategy for the integration of the activity within the wider ecosystem such that it promotes sustainable development, equity, and resilience of interlinked social-ecological systems".

***Good practice in sustainable aquaculture***

## Aquaculture Certification

Certification is the process through which an independent organization assures that a product or process is in compliance with a given set of standards. Over the past decade, aquaculture certification has grown dramatically. There are now about 30 aquaculture certification schemes/initiatives. Of these, several are niche schemes such as organic or animal welfare programmes.

The following are three examples of aquaculture certification schemes:

- **Aquaculture Stewardship Council (ASC)**. Founded by the WWF and the Sustainable Trade Initiative (IDH) in 2009, this scheme has already obtained the support of retailers and buyers in Europe and North America. ASC is an eco-label that builds on experiences from the Marine Stewardship Council (MSC) and Forest Stewardship Council (FSC).
- **GlobalGAP**. This is a retailer-led scheme that initially focused on agriculture/livestock products and was created to harmonize retailers' requirements. Over the past five years, GlobalGAP has expanded its scope to aquaculture. Initially set with species-specific standards, GlobalGAP now features a single set of standards applicable to all forms of aquaculture, provided they are produced in hatcheries.
- **Global Aquaculture Alliance (GAA)**. This aquaculture industry organization was established in 1997. In the early 2000s, GAA started to develop Best aquaculture practice (BAP) standards for shrimp aquaculture. This gradually expanded to include other species groups such as tilapia, pangasius, catfish and salmon. Compliance with BAP standards is indicated by a label on the package.

It may be possible to use indicators within a context of certification by proposing a certification scheme to host the indicators/standards. This would imply the need to follow the newly approved FAO Technical Guidelines on Aquaculture Certification and to establish a sound multi-stakeholder mechanism to identify the standards/reference points, accredit assessors/auditors, and assess farms.

Source: *Indicators For Sustainable Aquaculture In Mediterranean And Black Sea Countries - FAO (2013)*

## 3.6. Outlook

Fisheries and aquaculture in the Mediterranean are a sector of great socio-economic importance. Evidence from value chain analyses[98] and case studies indicates that the total economic value of fisheries in this region may be more than twice that indicated by landing values and employment rates alone.

From the analysis carried out, two significant trends emerge that will guide the industry over the next few years:

The alarming and deteriorating **state of Mediterranean fish stocks**, which is causing a significant decrease both in terms of catches and economic value, will require a transformation of the fishing sector towards a **sustainable business model**, focusing on **high-quality fisheries** that can add economic value through the ecological and ethical management of fish stocks. According to Plan Bleu (2015)[99], a **reduction of about 50% in stock pressure** will be needed, allowing a **sustainable recovery** and a potential increase of catches once a sustainable stock level is restored. The industry needs to focus on **small scale and artisanal fisheries**, integrating traditional activities in an innovative way with other strategic Blue Economy sectors, such as sustainable tourism. At the same time consumers need to be educated about the negative consequences of high fish and sea food consumption.

The **aquaculture industry is likely to grow**, both in quantitative and economics terms. According to EATiP (2012)[100], in the EU Mediterranean countries aquaculture will grow more than **100% by 2030**, generating over **10,000 new jobs** in the sector. Even greater growth could occur in Southern Mediterranean countries. As mentioned above, it will be important to **focus on the environmental and social impact**, along with **new technological options** and **sustainable management** of the marine environment in order to preserve the high biodiversity of the Mediterranean Sea and generate socio-economic development for coastal communities. Ideally, only certified organic aquaculture farms would be allowed in the Mediterranean. Caps on total production may be discussed to avoid uncontrolled growth of the sector.

[98] Dyck and Sumaila (2010), Economic impact of ocean fish populations in the global fishery

[99] Plan Bleu (2015), Economic and social analysis of the uses of the coastal and marine waters in the Mediterranean, https://planbleu.org/sites/default/files/publications/esa_ven_en.pdf

[100] EATiP (2012), The Future of European Aquaculture, http://www.eatip.eu/default.asp?SHORTCUT=444

# Operationalize sustainable Blue Economy in Maritime Transport

## 4.1. Overview

When examining maritime transport within the context of the Blue Economy, both operations at sea and at ports should be considered. In 2015, over **80% of the volume of international trade in goods was transported by sea**. In terms of value, the share of maritime seaborne trade is estimated to be around 60-70% of all international trade, and intra-Mediterranean maritime trade flows account for 25% of this[101]. The industry worldwide is expected to **grow by about 140% by 2030**[102]. These numbers provide an indication of the importance of the shipping industry for the Blue Economy and its prospects for economic growth and employment.

The environmental and social sustainability of maritime transport activities will have to guide its development in order to integrate economic growth with respect for marine ecosystems and coastal communities that base their economy on marine resources. Indeed, "*more integrated and efficient maritime transport, trade and logistics are major drivers for job creation, sustainable development and regional stability*" [103] . By doing so, it could significantly to contribute to **SDG 9** - Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation –, **SDG 13** - Take urgent action to combat climate change and its impacts and **SDG 14** - Conserve and sustainably use the oceans, seas and marine resources for sustainable development[104]**.**

Developing sustainable maritime transport in the Mediterranean is also essential for **MSSD** objective 4 (Addressing climate change as a priority issue for the Mediterranean[105]), as well as objective 5 (Transition towards a green and blue economy).

[101] UfM, the maritime sector, an opportunity for development and growth in the Mediterranean: http://ufmsecretariat.org/the-maritime-sector-an-opportunity-for-development-and-growth-in-the-mediterranean/
[102] OECD (2016), The Ocean Economy in 2030, http://www.oecd.org/environment/the-ocean-economy-in-2030-9789264251724-en.htm
[103] UfM, the maritime sector, an opportunity for development and growth in the Mediterranean: http://ufmsecretariat.org/the-maritime-sector-an-opportunity-for-development-and-growth-in-the-mediterranean/
[104] IMO and the Sustainable Development Goals: http://www.imo.org/en/MediaCentre/HotTopics/Pages/SustainableDevelopmentGoals.aspx
[105] UNEP/MAP (2016). Mediterranean Strategy for Sustainable Development 2016-2025. Valbonne. Plan Bleu, Regional Activity Centre

## 4.2. Current Status

### 4.2.1. Volume of traffic

Maritime transport, including related port activities, has reported significant growth in the Mediterranean over the past decades. The Mediterranean – **a hub for three different continents** (Europe, Africa and Asia) – records intense maritime transport of goods, energy products and passengers. To date, it is the **largest load and discharge centre for the transport of oil products** (18% of world transport). On the Mediterranean coast there are about **600 ports**, some of which are among the most important in the world[106].

Among the Southern Mediterranean countries, Egypt and Morocco have the largest and highest number of ports, 59 and 30 respectively. Egypt's port infrastructure has developed strongly over the last decade, also thanks to the enlargement of the Suez Canal[107].

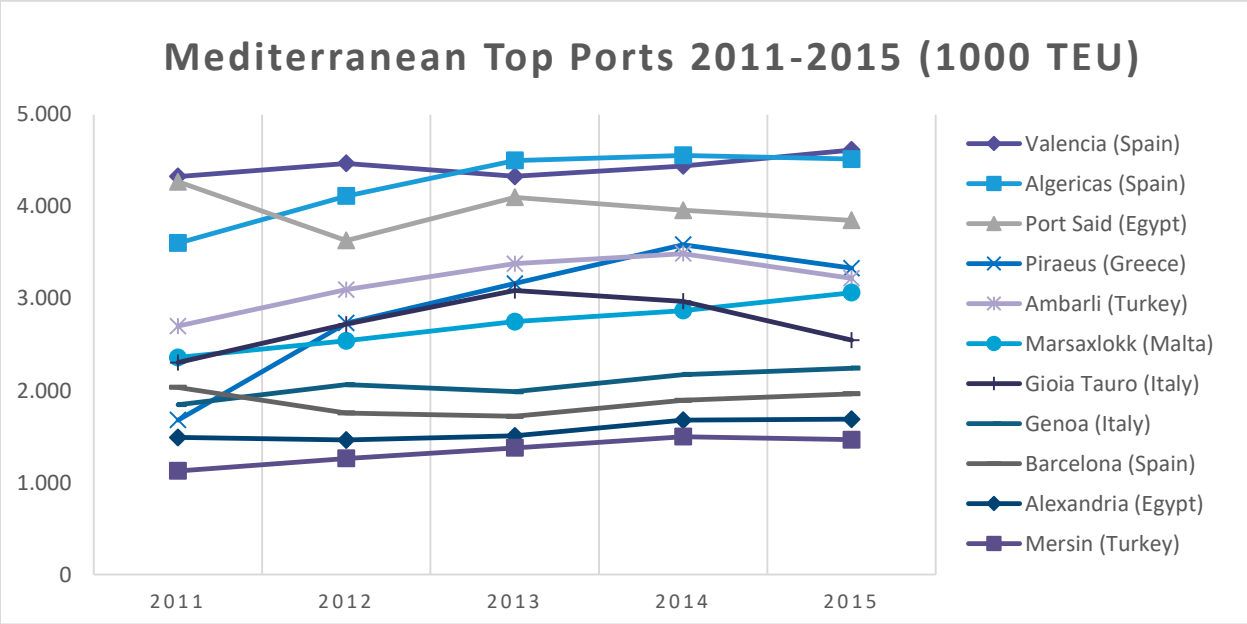



**Figure 20: Mediterranean top ports (Containerisation International Yearbook, IAPH)**

The fleet operating in the Mediterranean consists of more than **8,000 vessels**, with a total capacity of **210 million tonnes** of deadweight tonnage. The carrying capacity has seen a 30% increase over the past two decades, delivering about **20% of world seaborne trade** and 6% of worldwide container throughput. **Container port traffic has** tripled since the year 2000, confirming the trend of rapid growth of the sector.

[106] Plan Bleu (2015), Economic and social analysis of the uses of the coastal and marine waters in the Mediterranean, https://planbleu.org/sites/default/files/publications/esa_ven_en.pdf

[107] Eurostat (2015), Euro-Mediterranean statistics, http://ec.europa.eu/eurostat/documents/3217494/7053328/KS-GR-15-001-EN-N.pdf/08db83d1-966c-4b4d-869a-4a5dc2a9538d

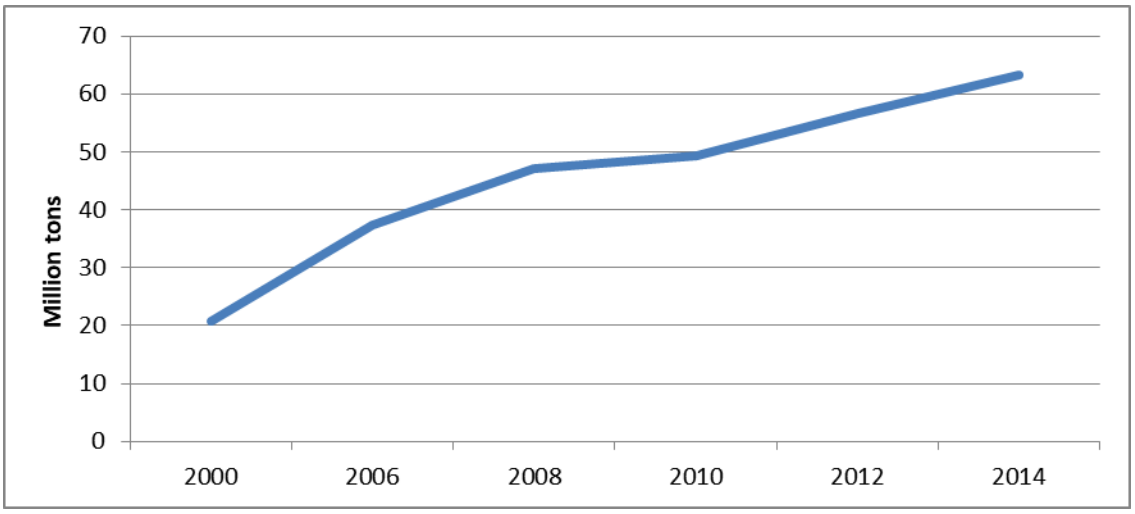



**Figure 21: Development of Mediterranean container port traffic 2000-2017 (Eurostat, World Bank)**

With regard to passenger transport (excluding cruises), according to Eurostat, **211 million passengers** were registered in 2015, slightly less than in previous years.

An important aspect of maritime transport is its connection with the tourism sector. The Mediterranean region is critical for the **cruise industry** (27,4 million passengers in 2015)[108]. The cruise ship sector is continually growing worldwide thanks to the dynamism of the Mediterranean market, **which is the second largest market in the world** after the Caribbean, with about **20 % of the global** distribution in 2013. Western Mediterranean countries (Spain, France and Italy) enjoy the highest growth[109] (see tourism chapter for more details).

### 4.2.2. Economic value and employment

The total revenue of the sector (transport services, port activities and shipbuilding) was **EUR 70 billion** in 2010, **generating a GVA of more than EUR 25 billion**, about 5% of the industry value worldwide. In terms of employment, it is estimated that about **550,000 jobs** are directly created by the industry. Growth in the industry stopped after the crisis in 2009, but a recovery is in progress both in terms of numbers and in traffic intensity[110].

[108] Medcruise (2017), MedCruise Statistics Report, http://www.medcruise.com/publications

[109] As the cruise industry is part of the tourism sector, it is not taken into account in the socio-economic analysis of maritime transport

[110] Plan Bleu (2015), Economic and social analysis of the uses of the coastal and marine waters in the Mediterranean, https://planbleu.org/sites/default/files/publications/esa_ven_en.pdf

## 4.3. Challenges

Maritime transport is also a cause of **pressures on the marine environment**: **about 10% of marine pollution** is caused by ships, from **emissions and leak of hazardous substances**. Approximately 0.1 % of the crude oil transported every year ends up deliberately dumped in the sea as the result of tank washing operations[111]. All other types of vessels are also potential sources of discharge of oily waste, including releases of oil during loading/discharging, bunkering, dry-docking operations and discharging of bilge oil. Other less known issues are the physical disturbance (**noise, sea-ground abrasion, collisions**) of marine species and the **transport of alien species** unsuitable for the Mediterranean ecosystem.

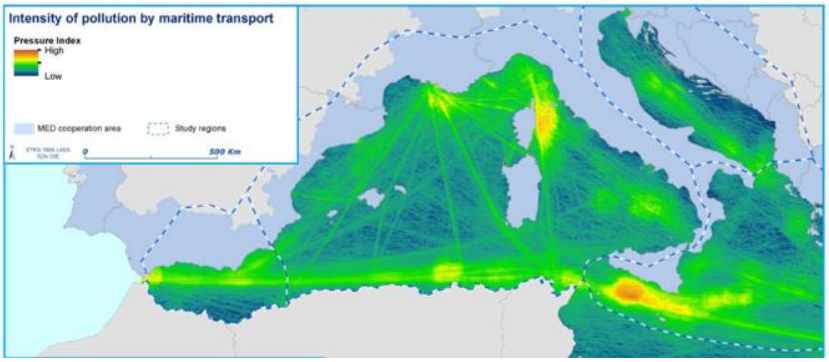



**Figure 22: Pollution by maritime transport in the Mediterranean (Med maritime project, 2015)[112]**

In terms of climate-related emissions, however, shipping is by far the **most efficient form of transport[113]**. Despite this, because more than 80% of the world's traded goods travel by sea, it still has a major environmental impact, accounting for 3% of greenhouse gas emissions[114]. For the Mediterranean, carbon emissions have been estimated based on the amount of bunker fuels reported by the Med countries. While those data show a decrease in emissions following the 2008 economic crisis, **emissions rebounded in 2014 to about 60 Mio t CO2 per year**.

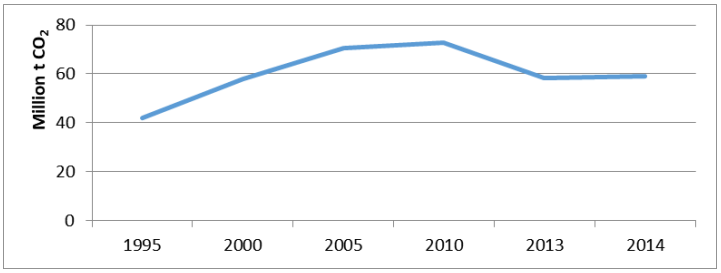



**Figure 23: Proxy indicator for estimating carbon emissions from vessels in the Mediterranean Sea (based on IEA data) [115]**

[111] Plan Bleu (2015), Economic and social analysis of the uses of the coastal and marine waters in the Mediterranean, https://planbleu.org/sites/default/files/publications/esa_ven_en.pdf
[112] Med Maritime Integrated Projects, Med-IAMER, http://www.medmaritimeprojects.eu/download/ProjectMediamer/Final_factsheets/WM_Transport_factsheet.pdf
[113] PD Cenek et al. (2012), Freight transport efficiency: a comparative study of coastal shipping, rail and road modes, http://www.nzta.govt.nz/assets/resources/research/reports/497/docs/497.pdf
[114] 3rd IMO GHG Study (2014)
[115] Calculated from amount of marine bunker fuel sold in Mediterranean countries (IEA data) multiplied by the conversion factor for the estimation of $C0_2$ emissions from fuel oil, which is 3.1144 (t $C0_2$ / t fuel).

The needs to mitigate the negative environmental impact is driving the industry to invest in new sustainable technologies, green ports and green shipping initiatives.

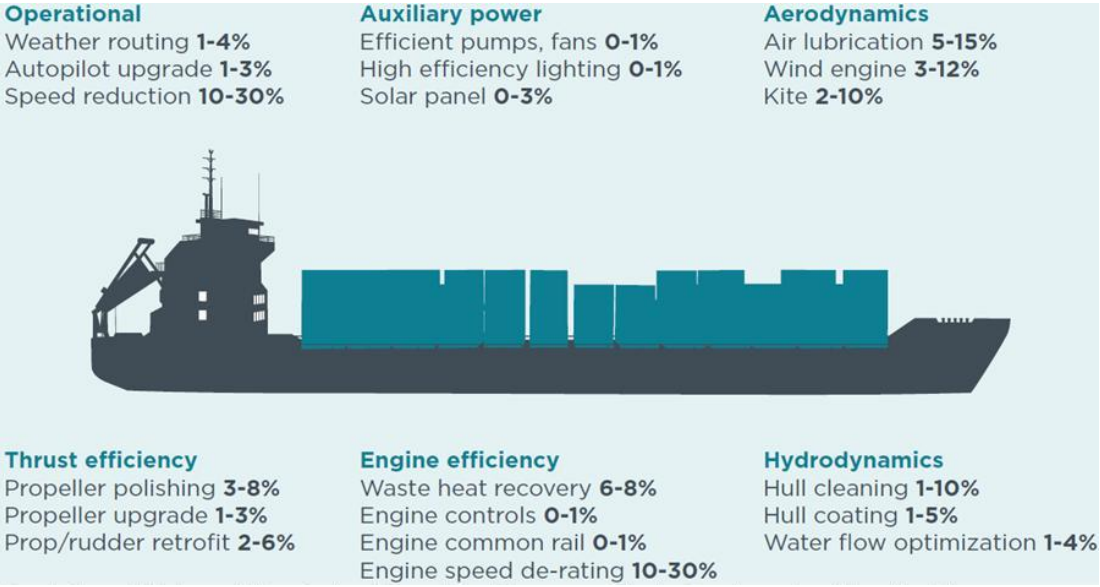



**Figure 24: Potential fuel use and C02 reductions from various efficiency approaches for ships (ICCT, 2013)**

## 4.4. Outlook

From the mid-90s to the mid-2000s, the Mediterranean recorded a rise of 58% in transit capacity, along with an increase in vessels size, which grew by 30% on average since 1997. It is expected that shipping routes in the Mediterranean basin will continue to increase in the coming years, both in number and traffic intensity[116]. A **4 percent per annum growth rate in global trade** in expected over the next decade and will be reflected on international maritime traffic routes at the Mediterranean regional level. Oil transport is set to rise to 750 Mt by 2025, with 6700 tankers/year likely to be navigating the Mediterranean, unless stricter renewable energy policies are enforced to avoid this scenario[117].

The countries of the Southern Mediterranean are also moving towards a new development phase of maritime activity. For example, the enlargement of the Suez Canal, inaugurated in 2015 by the Egyptian government, will allow a greater flow of goods to and from Asia. Morocco has also implemented a development plan for its ports, including the Mediterranean port of Nador with a total investment of EUR 1 billion boosting maritime infrastructure and expanding freight flows (see Box).

[116] Plan Bleu (2015), Economic and social analysis of the uses of the coastal and marine waters in the Mediterranean, https://planbleu.org/sites/default/files/publications/esa_ven_en.pdf
[117] Plan Bleu (2010), Maritime Transport of Goods in the Mediterranean: Outlook 2025, https://planbleu.org/sites/default/files/publications/cahier7_transport_en.pdf

***Case study on ports development***

## Tangier Med Port

*Morocco*

**DESCRIPTION**

In just over a decade, this ancient port city went from dormant to dominant. Between 2005 and 2012 Tangier created new jobs three times as fast as Morocco as a whole, while also outpacing national GDP growth by about 10%. Today, the city and its surrounding region of Tangier-Tétouan is a booming commercial gateway and manufacturing hub, with one of Africa's largest seaports and automotive factories.

A key role in the Tangier development process was the construction of the Tangier Med port, which began in 2004. In 2013 it recorded traffic of 2.6 million containers. In the coming years, Tangier Med will reach 3.5 million containers, thus becoming the largest African container port. Realizing the further extension (Tangier Med II), which will be completed in 2019, the overall capacity of the port will reach 8.5 million containers per year.

In consultation with the business community, the city and regional governments embarked on a host of "place-making" initiatives to improve the quality of life for Tangier's residents and visitors alike, from better water supply and waste management, to the preservation of green spaces, restoration of cultural monuments and beaches, and reduced traffic congestion and pollution through more effective geospatial planning. Meanwhile, the city's old port of Tangier Ville is being redeveloped, helping to attract cruise ships, the construction of a new marina, and the relocation of fishing vessels and accompanying industries.

The example of Tangier is believed to be contributing to a general reflection about the territorial impacts of multi-layered hubs. The very ambitious multifunctional project (Tangier Med) aims at exploiting economies of scale for large containerships regionally while attracting value-add and skills locally and nationally through industrial and logistics parks. The Tangier case shows that the development of port infrastructures in Southern Mediterranean Countries can provide a good opportunity for economic growth and industrialization throughout the region.

Source: *https://blogs.worldbank.org/psd/voices/tangier-morocco-success-strait-gibraltar*

In the next years (until 2025) **the volume of goods transported is expected to increase** in the Mediterranean by[118]:

- Intra Mediterranean area: 20% (219 million tons)
- Asia: 37% (411 million tons)
- Rest of world: 35% (389 million tons)

Transport flows must be combined with a more efficient management of their impacts on the marine ecosystem through the development of clean technologies and better prevention of accidents that can cause spills of harmful substances. One of the institutional initiatives for sustainable maritime transport, is the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC), that through a close collaboration between coastal Mediterranean States contributes to preventing and reducing pollution from ships and combating pollution in case of emergency.

In order to ensure sustainability in the sector, the IMO (International Maritime Organization) outlined a conceptual definition of Sustainable Maritime Transport, which "*must deliver safe, secure, efficient and reliable transport of goods across the world, while minimizing pollution, maximizing energy efficiency and ensuring resource conservation*" [119]. In 2015 the Global Maritime Energy Efficiency Partnership (GloMEEP)[120] was launched, as a joint project of the Global Environment Facility (GEF), United Nations Development Programme (UNDP) and IMO. Focusing on developing countries where shipping is increasingly concentrated (Morocco for the Mediterranean region), GloMEEP is building capacity to address maritime energy efficiency and to bring this issue into their own development policies, and dialogues.

GloMEEP recently launched the Global Industry Alliance to Support Low Carbon Shipping, in which a group of world-leading private companies from different sectors of the industry are coming together to contribute to tackling the challenges of decarbonizing the shipping sector.

While policy makers have stalled in the regulation of the environmental impacts of maritime transport, new private green shipping initiatives are emerging. These initiatives are improved by powerful corporate actors, in particular the largest container shipping customers and multinational brand retail companies[121][122]. In addition to environmental benefit, the implementation of these strategies can lead to economic and employment opportunities through green technologies and sustainable management skills. Of paramount importance is the adoption of safer technologies and safer operational processes to prevent leaks of hazardous substances and sea pollution.

Another fundamental need is to use sustainability criteria to develop and manage new port infrastructures in the southern Mediterranean (as in Morocco and Egypt). This will require a balance of port-city relations, integrating environmental integrity, economic growth and quality of life for local communities. To be

[118] Plan Bleu (2010) - Maritime Transport of Goods in the Mediterranean
[119] IMO (2013), A concept of a sustainable maritime transportation system, http://www.imo.org/en/About/Events/WorldMaritimeDay/WMD2013/Documents/CONCEPT%20OF%20%20SUSTAINABLE%20MARITIME%20TRANSPORT%20SYSTEM.pdf
[120] GloMEEP: http://glomeep.imo.org/
[121] Jane Lister (2014), Green Shipping: Governing Sustainable Maritime Transport, University of British Columbia,
[122] An example is provided by „Green Marine", an environmental certification program developed by many actors of the North American industry; https://www.green-marine.org

successful, the development of sustainable maritime transport needs to be integrated with green strategies in the other related sectors of the Blue Economy, primarily tourism and energy.

***Good practice on sustainable shipping***

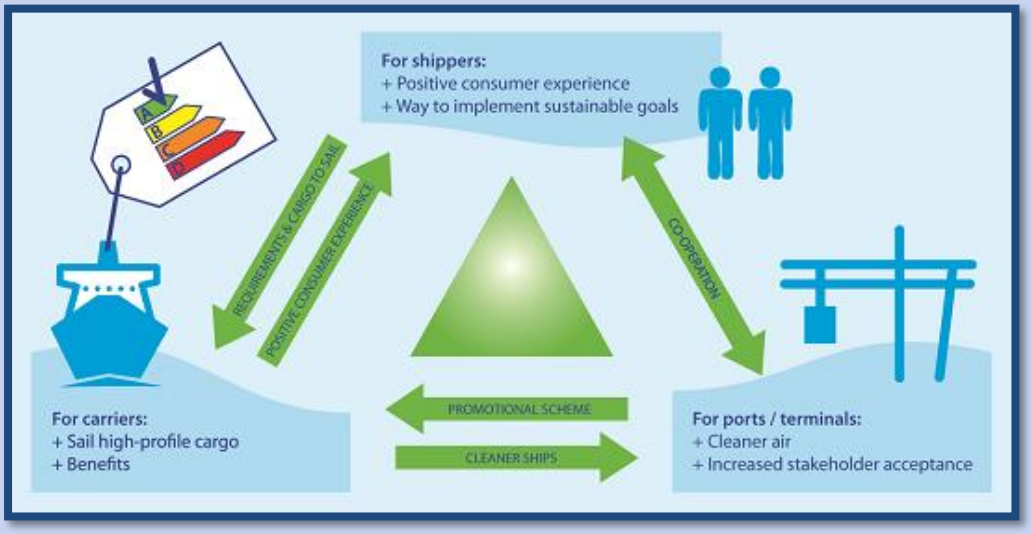
## ESI - Environmental Ship Index

*World Ports Climate Initiative (WPCI)*

The Environmental Ship Index (ESI) identifies seagoing ships that are better at reducing air emissions than required by the current IMO emission standards. The index is intended to be used by ports to reward ships that participate in the ESI and will promote clean ships: but it can also be used by shippers and ship owners as their own promotional instrument.

There are currently close to 7000 ships with a valid ESI score and some 50 ports participating world-wide but only three from the Mediterranean (Marseille, Civitavecchia and Ashdod).

The ESI evaluates the amount of nitrogen oxide (NOx) and sulphur oxide (SOx) emitted by a ship; it also includes a reporting scheme on the greenhouse gas emissions of the ship. The ESI is a useful indicator of the environmental performance of ocean going vessels which helps identify cleaner ships generally. ESI is voluntary but WPCI hopes that the global port community will assume its role in improving the maritime and port environment. All stakeholders in maritime transport can use the ESI as a means to improve their environmental performance.




*Source: http://www.environmentalshipindex.org*

# Blue Economy emerging sectors: Shipbuilding and Recycling

## 5.1. Overview

An important part of the economic value and employment generated by maritime transport is related to the shipbuilding industry (building, repair, disposal and recycling). Shipbuilding accounts today for about 4 % of total value added by ocean-based activity worldwide[123].

According to the findings of the **OECD Council Working Party on Shipbuilding**, there has been a global surge in excess shipbuilding capacity in recent years. Profitability of the industries is unsustainably weak, and the economic viability of the industry is being threatened. Another key point that emerged from OECD analysis is the conditions of workers; these need clearer contractual relations and better regulations on labour security and workplace safety[124]. The development of the sector in the near future will have to be oriented towards a general reorganization, which strongly focuses on **technological innovation** as well as the **social and environmental sustainability of production processes**.

## 5.2. Current status

Among the Mediterranean countries, **Italy** has most activity in the shipbuilding industry, followed by **France**, **Turkey**, **Spain** and **Greece**.

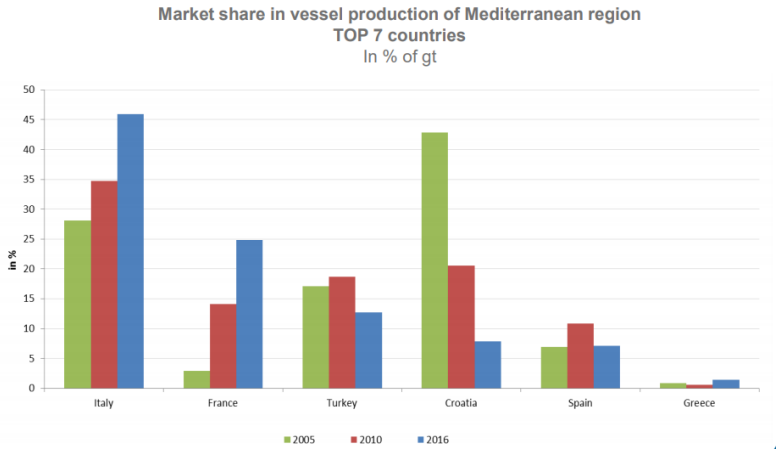



**Figure 25: Market share in vessel production in Med region (OECD, 2016)**

[123] OECD (2016), The Ocean Economy in 2030, http://www.oecd.org/environment/the-ocean-economy-in-2030-9789264251724-en.htm

[124] OECD (2016), Shipbuilding and Ship Recycling in the Mediterranean Region, https://planbleu.org/sites/default/files/upload/files/6_Shipbuilding_ship_recycling_in_Mediterranean_Daniel_OECD.pdf

According to HIS seaweb data reported by the OECD, 80% of the ship types produced in the Mediterranean region are **cargo** and **passenger** ships.

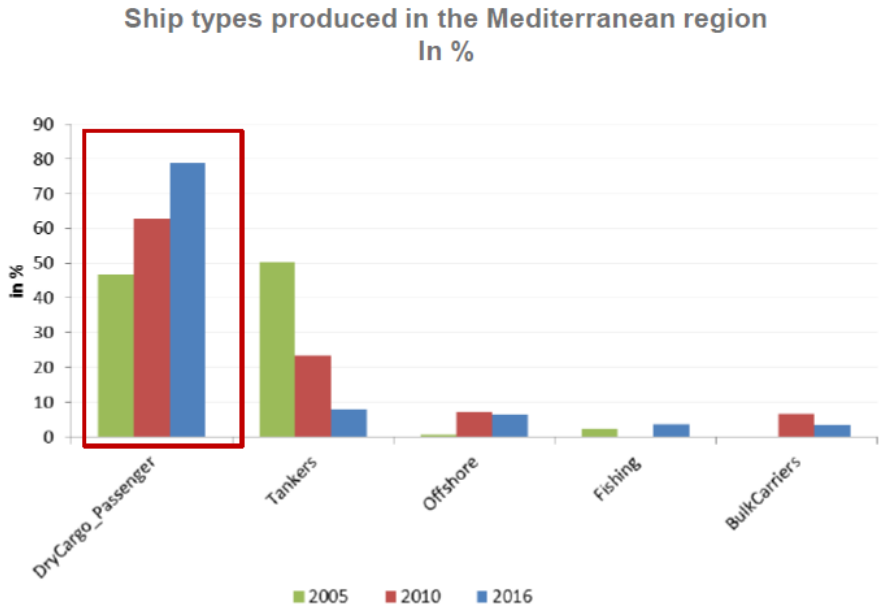



**Figure** 26**: Ship types produced in Mediterranean region (OECD, 2016)**

Mediterranean European countries are strong competitors in the shipbuilding industry on a world scale in **particular niches**: luxury yachts, cruise ships, icebreakers, tugboats and naval ships. In addition, the military vessel segment is relevant in Europe. In general, these segments are characterized by a **high degree of specialisation and high-tech qualities**, complex production processes, in combination with a limit to the numbers of vessels of the same type that are to be built[125].

**Box: Ship demolition and recycling: the case of Turkey**

Turkey is not only a significant ship producer but also the world's fifth largest ship recycler, and the largest outside South-Asia and China. Turkey accounted for 98% of demolition volume in the Mediterranean region between 2006 and 2015, with Spain (1.22%), Greece (0.22%), Portugal and France (each 0.17%) and Egypt (0.15%) trailing far behind. Most of the ships that are recycled in Turkey are foreign flagged, primarily from European Union members, and are often smaller vessels that may not be economical to sail to recycling yards in South Asia[126].

[125] European Cluster Observatory (2012), Shipbuilding Industry, http://www.clusterobservatory.eu/eco/uploaded/pdf/1346836021947.pdf
[126] OECD (2011), The Shipbuilding Industry in Turkey, https://www.oecd.org/turkey/48641944.pdf

## 5.3. Challenges and outlook

The shipbuilding industry is **one of the toughest metal industries** with risk of exposure to several hazardous chemicals and materials. Most of the traditional production processes such as welding, painting, blasting and fiberglass production can have negative impacts on workers' health and safety, as well as adverse effects on the environment.

Several green shipbuilding and recycling initiatives have been put in place by the IMO, the European Union and shipping industry players to make the sector sustainable[127].

The scope of green shipbuilding includes **green ships** and **green shipyards**, through both product and process innovations. Green ships mainly depend on innovative technologies for ship design that minimalize adverse effects on the environment during their entire life cycle. The keys to green ships design are:

- Reduce the consumption of materials and energy
- Reduce pollution and emissions in ship manufacturing and service
- Recycle the parts and accessories in ship maintenance
- Reuse the majority of materials after ship is laid up

The transition towards sustainability that the ship industry will go through includes the improvement of the fuels used (e.g. reduction in amount of sulphur) and their replacement with **cleaner sources** like **LNG, (renewable)**, **hydrogen**, **electricity**, or even wind power. There are promising projects and prototypes of ships powered by green technologies under way around the world, such as the first electric ferry which currently runs in Norway, but could easily be produced and deployed in Mediterranean countries.

**Figure 27: The first electric ferry in the world in Norway, 2015**

[127]OECD (2016), Environmental Policy and Technological Innovation in Shipbuilding, http://www.oecd-ilibrary.org/science-and-technology/environmental-policy-and-technological-innovation-in-shipbuilding_5jm25wg57svj-en

The world's largest hybrid ferry developed uses wind rotors and hydrogen in combination with batteries and fuel cells.

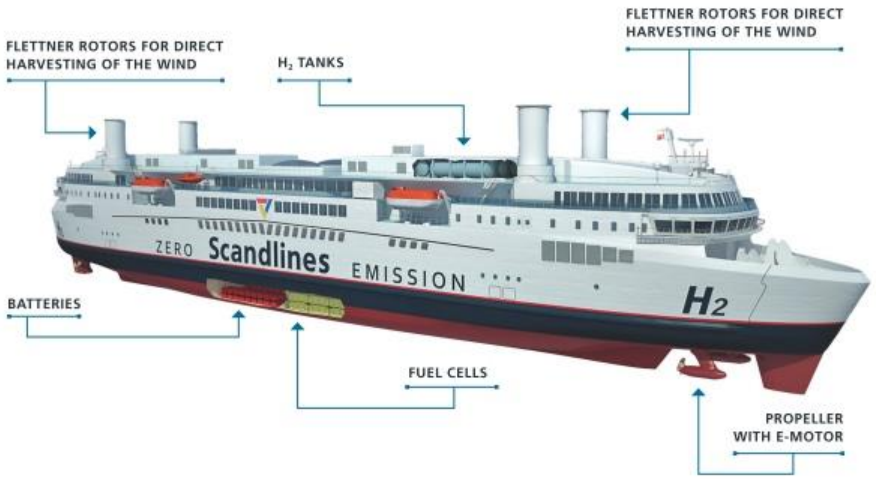



**Figure 29: example of H2 "zero emission" ferry project by Scandlines**

New wind propulsion systems can reduce fossil fuel consumption. For instance, the **SkySails System,** developed for modern cargo vessels can be installed on new existing vessels. Fuel consumption of ships can be cut in half on windy days, which saves on average 10-15% in fuel every year[128]. Moreover, ships will significantly reduce their emission levels: The IMO estimates that up to 100 million tons of carbon emissions could be eliminated worldwide every year by using kite technology[129].


**Figure** 30**: The Skysails system**

[128] Skysails: http://www.skysails.info/english/skysails-marine/skysails-propulsion-for-cargo-ships/advantages/
[129] IMO (2009), Second IMO Greenhouse Gas Study 2009, http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/SecondIMOGHGStudy2009.pdf

Similarly, a French company is developing a kite technology that could be used for all kinds of ships such as commercial cargos, recreational boating, or fishing or for security, and could be used in the Mediterranean. This would decrease fuel consumption by between 20% and 40%, making the technology viable in the short-term[130]. It has been estimated that the system could save up to USD 1 million for a cargo trip between Europe and Asia.

There are currently a number of innovative concepts under investigation and testing which include not only wind but also the use of solar photovoltaics to reduce fuel consumptions, see pictures below:


**Figure** 28: **Fixed wing and solar PV hybrids (IRENA, 2015)**[131]

**Research and innovation in green shipbuilding** as well as specialization in building and retrofitting energy-efficient ships could therefore be an important part of the Blue Economy in the Mediterranean. Through the production of more efficient, safer and cleaner vessels, the Mediterranean shipbuilding industry could aim to become a key player for **improving the environmental performance of the maritime transport sector as a whole**.

[130] Beyond the Sea: http://www.beyond-the-sea.com/beyond-the-sea/atouts/
[131] IRENA (2015), Renewable Energy Options for Shipping, http://www.irena.org/DocumentDownloads/Publications/IRENA_Tech_Brief_RE_for%20Shipping_2015.pdf

# Blue Energy

## 6.1. Overview

The energy sector of a sustainable Blue Economy focuses on renewable offshore energy. Today the only commercially available technology that could potentially be economically deployed in the Mediterranean Sea is offshore wind (see box for innovative maritime energy technologies such as wave energy, tide and current or algae). However, due to the deep waters prevailing in the Mediterranean, mainly floating wind turbines would be feasible; experience with this technology is growing but it is not yet widely available[132].

**Onshore wind and PV installations close to the coast and on islands** could also be considered part of Blue Economy as they are economically viable renewable technologies that can be widely used in Mediterranean countries. These plants can power ports, coastal towns or tourist accommodation and are therefore linked to other Blue Economy sectors. However, as onshore renewables are generally considered part of the "Green Economy", only building-integrated solutions for the tourist sector are discussed in this document.

The development of ocean energy will especially contribute to achieving **target 7.2 of the SDGs**: "By 2030, increase substantially the share of renewable energy in the global energy mix". Developing renewable energy in the Mediterranean is also essential for **MSSD Objective 4** ("Addressing climate change as a priority issue for the Mediterranean"[133]), especially action 4.4 ("Encourage institutional, policy and legal reforms for the effective mainstreaming of climate change responses into national and local development frameworks, particularly in the energy sector"), as well as **Objective 5** ("Transition towards a green and blue economy").

## 6.2. Current status

The **renewable energy sector is not yet developed** in the Mediterranean Sea. There are currently no operational offshore wind farms in the Mediterranean Sea, and other types of blue energy are still in their infancy.

Despite the fact that in 2016 there were 14.4 GW of offshore wind power capacity installed world-wide[134], **no commercial offshore wind parks yet exist in the Mediterranean.** Several projects have been studied in North Mediterranean countries though, e.g. in France where two projects in the Golf de Fos have received authorized consent (Nénuphar, 10 MW and 2 MW floating test sites) and Italy with also two

[132] Eco-Union & Plan Bleu (2017), Indicators for the Blue Economy in the Mediterranean
[133] UNEP/MAP (2016). Mediterranean Strategy for Sustainable Development 2016-2025. Valbonne. Plan Bleu, Regional Activity Centre, http://planbleu.org/sites/default/files/publications/mssd_2016-2025_final.pdf
[134] GWEC (2016), Global Wind 2016 report, http://www.gwec.net/wp-content/uploads/2017/05/Global-Offshore-2016-and-Beyond.pdf

authorized projects (Sicily, Taranto). According to EWEA, offshore wind energy could produce up to **12 GW by 2030 and close to 40 GW by 2050** for Mediterranean EU countries[135].

Potential locations for offshore wind farms (where annual wind speeds are greater than 5m/sec at a height of 80m above sea level) include large parts of North African coasts, especially Tunisia, Libya, and Egypt.

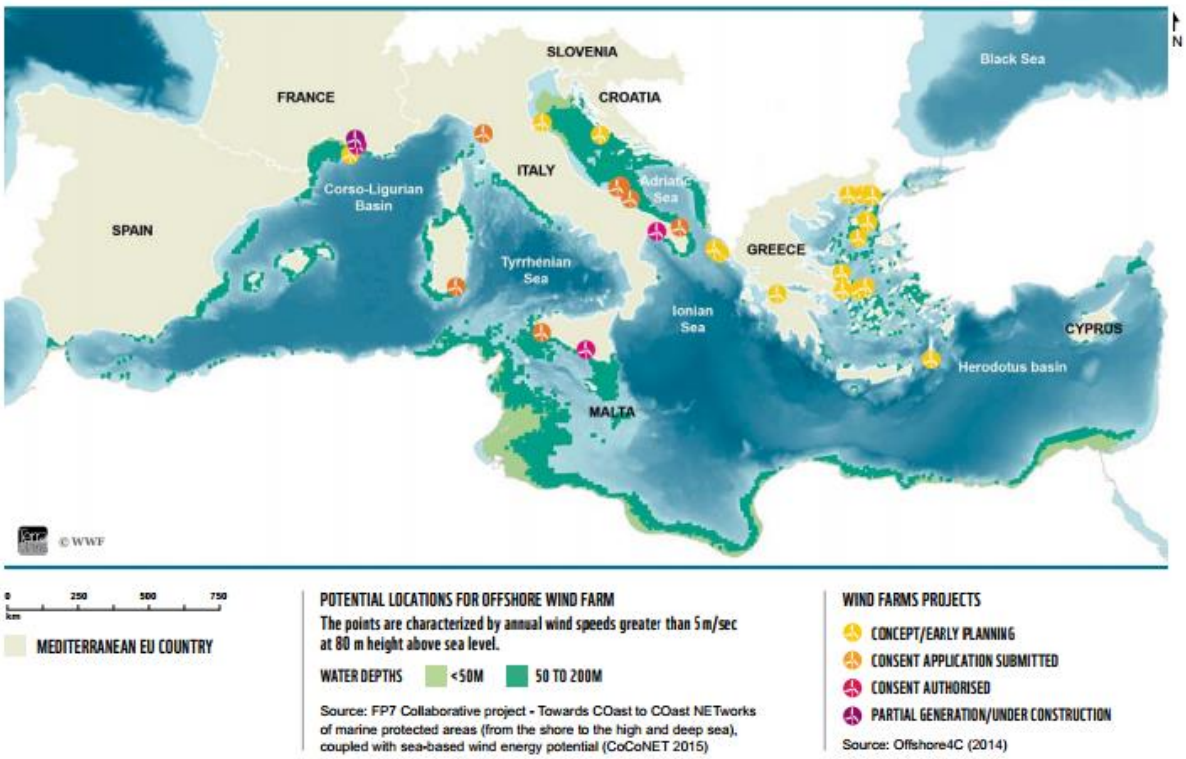



**Figure** 29: **Potential locations for offshore wind farms (WWF)**

Wind energy potential is especially high in the Southern and Eastern Mediterranean region. SEMCs are estimated to have a technical wind power potential of 21,967 TWh/year, 34 times more than the northern countries[136].

[135] WWF (2015), Blue Growth in the Mediterranean Sea: the challenge of good environmental status, http://d2ouvy59p0dg6k.cloudfront.net/downloads/medtrends_regional_report.pdf

[136] Tagliapiertra S. (2015), Renewable Energy in the Mediterranean: Current Status and Future Prospects, Review of Environment, Energy and Economics, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2603180

### The CoCoNet project

The European funded **CoCoNet project**[137] that ran from 2012 to 2016 revealed favourable areas for offshore wind farms in the Mediterranean Sea, based on wind availability and constraints related to biodiversity and ecosystems conservation as well as socio-economic potential. Areas characterized as "excellent" for such development are located in the Aegean Sea. Moreover, the most extensive Mediterranean areas that are favourable to this development are the North African coast (from Tunisia up to Egypt) and the Adriatic Sea. In addition, areas characterized as "very good" are found in the Gulf of Gabes and the northern part of the Gulf of Tunis (Tunisia), the Gulf of Lions (France), the Aegean Sea (Greece), the eastern part of the Gulf of Sirte (Libya), and in the coastal and offshore area of Otranto city (Italy) in the Adriatic Sea.

The project also found that offshore wind farms that are properly designed and deployed are generally not a threat to marine biodiversity[138]. Instead, they can bring environmental benefits by providing a surface to which animals can fix themselves, which can increase the number of shellfish and related animals of their trophic chain, including fish and marine mammals. Excluding boats from the area around the wind farms can also lead to lower disturbances from shipping and the zone could thus be considered as a marine reserve.

### Oil & gas in the Mediterranean

Even though by definition not part of a sustainable Blue Economy, oil and gas exploration and extraction remain an important activity in the Mediterranean Sea.

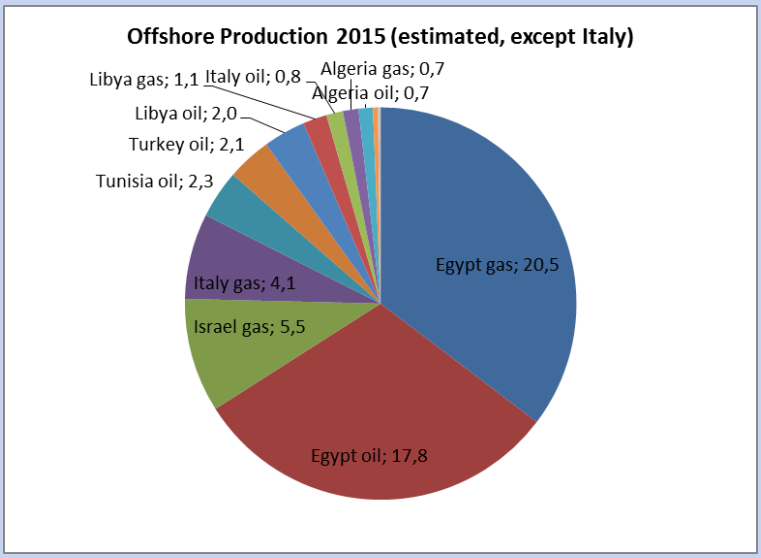



**Figure 30: Offshore oil and gas production (Own calculation based on BP and IEA 2016; share of offshore estimated by country)**

[137] COCONET project, http://cordis.europa.eu/project/rcn/101654_en.html
[138] European Commission (2016), COCONET Report Summary, http://cordis.europa.eu/result/rcn/189828_en.html

44% of the Mediterranean Sea is either contracted or designated for oil & gas exploration. New deep-sea exploration can be expected mainly in the Eastern Mediterranean. Any extraction of oil and gas increases the risk of pollution and contributes to climate change.

## 6.3. Challenges and Outlook

### 6.3.1. Renewable energies

The Mediterranean energy demand depends heavily on fossil fuels: the dependence of the region on imports equals 40% of the energy mix. The introduction of renewable energy and energy efficiency measures could see this drop to less than 25%.

Moreover, Southern fossil fuel producing countries could increase their exports and associated revenues by using more renewable energy and less fossil fuels themselves.[139]

A feasibility study of a 12 MW floating wind park was undertaken in the deep waters of Aegean Sea (Greece)[140]. The study found that the total social benefits from the operation of the floating wind park would equal EUR 11.9 million. These would be related to the reduction in oil imports, the savings in carbon dioxide emissions and the reduction of external costs.

**Developing renewable energy in Southern Mediterranean countries will enable them to meet their increasing energy demand:** Today, the Northern Mediterranean region accounts for two-thirds of Mediterranean primary energy demand. However, energy demand in South Mediterranean countries is expected to grow due to stronger economic and population growth, and may exceed that of Northern countries within the next 25 years[141].

**Innovative ocean energy**

The potential of other ocean energy technologies, i.e. tidal, wave, current, osmosis, and ocean thermal energy conversion (OTEC), is rather limited for the Mediterranean.

**Wave energy**

The wave energy potential in the Mediterranean Sea is very low, with a highest average wave power of 6kW/m. Today, this technology is more expensive than offshore wind, and less developed. The lack

[139] Observatoire Méditerranéen de l'Energie (2015), Mediterranean Energy Perspective, http://www.ome.org/publications/mep-2015/

[140] Zountouridou E.I. et al. (2015), Offshore floating wind parks in the deep waters of Mediterranean Sea, Renewable and Sustainable Energy Review, http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.723.574&rep=rep1&type=pdf

[141] UNEP, MAP, Plan Bleu (2016), Tourism and sustainability in the Mediterranean: key facts and trends, http://planbleu.org/sites/default/files/publications/tourism_and_sustainability_june2016.pdf

of underwater grid-connections in the Mediterranean Sea is another challenge. Thus, the development of wave energy is forecast to be limited in the future.

However, the **REWEC3 project** intends to exploit the potential of wave energy in the Mediterranean. The estimated average electrical energy that could be produced during 1 year from a REWEC plant in the Central Mediterranean Sea, with a total length of 1km would be **6-9GWh**[142].

**Tides and currents**

Tidal energy potential is limited to the Straits of Messina, Bosphorous and Gibraltar. Even though underwater turbine technology is mature, the Mediterranean lacks underwater grid-connections. Thus, electricity generation based on tides and currents is expected to remain limited in the future.

**New wind technologies: airborne wind energy**

Another example of innovative offshore technology is the **Airborne Wind Energy Systems (AWES)**[143] using an autonomous, tethered aircraft or kite that converts the stronger winds at higher altitudes (300-500m) into electricity. When the flying device moves, it pulls the tether which drives a generator. This technology has the potential to significantly reduce material consumption and thus costs. So far the technology is still in the demonstration phase but commercialization of systems of between 100 kW and 2 MW is envisaged in the near future. The technology is especially interesting for offshore applications in deep waters where it can be deployed on floating platforms, making it particularly fitted for the Mediterranean.

**Figure 31: Offshore Airborne Wind Energy System (Ampyx Power)**

[142] REWEC3, http://www.wavenergy.it/documents/leaflet_weavenergy%20GB.pdf
[143] Ampyx Power, https://www.ampyxpower.com/

**Energy from algae**

The project **Production of biodiesel from algae in selected Mediterranean Countries (MED-ALGAE[144])** started in 2012 and involves twelve organizations (research organizations, academic institutions, energy agencies and private organizations) from six Mediterranean countries: Cyprus, Malta, Egypt, Lebanon, Greece and Italy[145]. Its goal is to foster the development of microalgae as an alternative fuel and to contribute to the establishment of a new value chain for the production of renewable energy based on microalgae, thus securing a sufficient quantity and quality of biodiesel.

The project looks at every stage of the value chain: selection of microalgae, species identification, cultivation, harvesting and extraction of biodiesel as well as determination of the properties of biodiesel. It intends to study the available state-of-the-art technologies and provide feasibility studies of potential production. Microalgae by-products and related new business opportunities are also part of the research. The project will establish several pilot laboratories, and an algae growth unit for biodiesel production, as well as the "Mediterranean Regional Centre for Bioproduction" in Alexandria which would be a training, demonstration, and workshop centre for the region.

In June 2016, the project's Lebanese team won the "National Energy Globe Award" for having found 20 varieties of microalgae that could potentially be used to produce biodiesel[146].

Producing biodiesel from algae has a great potential: algae grow easily and quickly, and their return is up to 10 times that of traditional biofuels such as colza or palm oil[147]. Moreover, since they are cultivated in the sea, they are not in competition with food production, and have a limited environmental impact. Moreover, producing microalgae at an industrial scale could be associated with carbon capture projects. Nevertheless, this technology is still in its infancy and requires more research and pilot projects before it reaches commercialization.

[144] *Med Algae project: http://med-algae.com/about/*
[145] *Description of Med Algae project: https://www.keep.eu/keep/project-ext/10817*
[146] *IEVP CTMED (2016), Liban: le projet MED-ALGAE remporte le "National Energy Globe Award", http://www.enpicbcmed.eu/fr/communication/liban-le-projet-med-algae-remporte-le-%C2%AB-national-energy-globe-award-%C2%BB*
[147] IEVP CTMED (2014), Les algues seraient-elles le carburant du futur?, http://www.enpicbcmed.eu/fr/communication/les-algues-seraient-elles-le-carburant-du-futur

## 6.3.2. Critical issues

The development of renewable energy in general, and off-shore production specifically, can be influenced by several factors:

**Global, regional and local policies (**regulation, incentives, phase out of fossil fuel subsidies**):** The legal and regulatory frameworks for energy, to be based in the Paris Agreement, need further development to attract private investors, particularly in North Africa and the Western Balkans. Although there are binding targets for renewable energy in most countries, their effective implementation is still uncertain. As there is still no level playing field with conventional energy, support schemes for the deployment of renewables are required. For instance, direct and indirect fossil fuel subsidies persist in many countries. A good example is Egypt, where a recent reform has effectively reduced for the first time the country's u energy subsidies system.

**Cost of production and technological development:** The cost of offshore wind production has significantly decreased in recent years, reaching now a levelized cost of energy below 50 EUR/MWh[148]. For floating technology, a reduction in cost is expected due to technical improvements, e.g. using concrete instead of steel for the substructure, and mass production. Other ocean energy technologies may see technological breakthroughs in the years to come.

**Access to finance:** Key European financial institutions (e.g. European Investment Bank, European Bank for Reconstruction and Development) could cooperate to develop a "Mediterranean Renewable Energy Infrastructure Fund" aimed at channelling financial resources or bonds from institutional investors to renewable energy companies in the region, for solar and wind energy projects[149].

**Oil & gas prices:** Increasing oil and gas prices would potentially be beneficial for the development of offshore wind and ocean renewables. On the other hand, it can make the exploration of oil & gas fields in the Mediterranean more attractive, thus luring investors to fossil resources. In the end, the direction of development in the energy sector in the Mediterranean is a matter of the long-term vision of policy makers.

[148] GWEC (2016), Global Wind 2016 report, http://www.gwec.net/wp-content/uploads/2017/05/Global-Offshore-2016-and-Beyond.pdf

[149] Tagliapiertra S. (2015), Renewable Energy in the Mediterranean: Current Status and Future Prospects, Review of Environment, Energy and Economics, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2603180

# Other Blue Economy sectors

## 7.1. Bioprospecting

### 7.1.1. Overview

Bioprospecting is defined as "*the **search for interesting and unique genes, molecules and organisms** from the marine environment with features that may be of benefit for society and have value for commercial development"*[150]. It can for instance have applications **in medicine, food, materials, energy or cosmetics**, and has the potential to make a significant contribution to green growth in many industrial sectors. As an example, an anti-leukaemia drug was developed in the 1960s thanks to a sea sponge from the Caribbean[151]. Since many microbial species have not yet been discovered, bioprospecting has a huge potential, and developing this sector could help addressing major global challenges.

In that sense, bioprospecting can particularly contribute to **achieving SDG 3,** i.e. "*ensure healthy lives and promote well-being for all at all ages",* and especially SDG 3.B *"support the research and development of vaccines and medicines for the communicable and non-communicable diseases that primarily affect developing countries*".

### 7.1.2. Current status

There is little statistical data on the global development of bioprospecting, and even less regarding the Mediterranean specifically. It has been estimated by the European Union that the sector may be producing a **GVA of EUR 1 billion in European waters**, although no statistical databases back these estimations[152]. On the other hand, a report published by Global Industry Analysts tried to define a value for the Blue Economy sector, and estimated that the size of the **European Blue Biotech** sector in 2012 was around EUR 302 – 754 million in terms of revenues[153]. If a market growth of 6-8% per annum is maintained, revenues from in Europe from this sector should reach €1 billion by 2020, which would result in the creation of 10,000 jobs[154]. There seems to be no data on the economic value of Blue Biotechnology market (GDP contribution) nor on public funding of R&D.

[150] Ecorys and Consortium Partners (2014), Study in support of Impact assessment work on Blue Biotechnology, https://webgate.ec.europa.eu/maritimeforum/sites/maritimeforum/files/Blue%20Biotech%20-%20Final%20Report%20final.pdf

[151] World Bank (2017), The Potential of Blue Economy – Increasing long-term benefits of the sustainable use of marine resources for small island developing States and coastal least developed countries, https://openknowledge.worldbank.org/bitstream/handle/10986/26843/115545.pdf?sequence=1&isAllowed=y

[152] Plan Bleu (2017), Strategic guidelines for a Blue Economy in the Mediterranean

[153] Ecorys and Consortium Partners (2014), Study in support of Impact assessment work on Blue Biotechnology, https://webgate.ec.europa.eu/maritimeforum/sites/maritimeforum/files/Blue%20Biotech%20-%20Final%20Report%20final.pdf

[154] Ibid.

Patent claims regarding marine organisms in the Mediterranean are **mostly registered by European countries**, as shown in the following graph. Israel and Turkey are the only non-European Mediterranean countries where patents have been claimed during the 1991-2009 period.

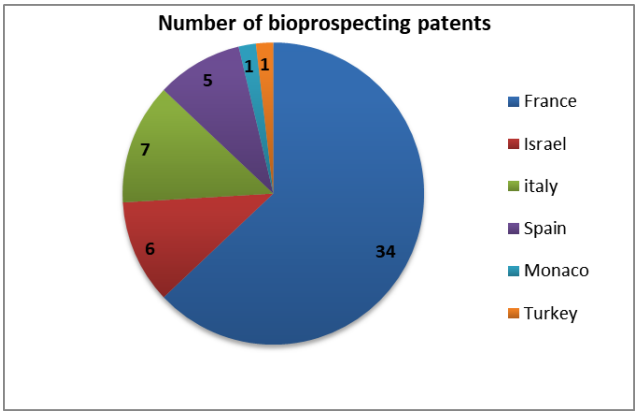



**Figure 32: Patent claims on marine organisms in Mediterranean countries, 1991-2009 (eco-union, Plan Bleu, 2017)**

In Europe, over 50% of the patents registered relate to health, followed by cosmetics, genetics and food & fee. Patents claims in energy and aquaculture are much less important.

Due to the small number of registered patents, it can be assumed that the bioprospecting sector implies low employment, even if the jobs created are probably highly qualified. In a report on Blue Biotechnology, Ecorys estimated that the number of employees in the Blue Biotech sector in Europe could range from 11,355 to 39,750[155].

Since the quantities of marine resources that are currently extracted are low, the environmental impact of bioprospecting is estimated to be low. In the longer-term, the potential impacts are rather unclear. If bioprospecting undergoes an important development, there could be risks of biological contamination and over-exploitation of organisms.

**Mediterranean bioprospecting programs.**

**ULIXES** is a FP7 research project funded by the European Union that ran between 2011 and 2014[156]. It involved several Mediterranean countries, including Tunisia, Jordan, Egypt, Morocco, Greece, Italy and Spain. Searching for microbes to treat marine pollution, researchers have created the largest-ever collection of Mediterranean microorganisms. Further research could use these findings to treat polluted marine sites.

**The Mediterranean Science Commission** [157] (CIESM) promotes international research in the Mediterranean and Black Sea and has 23 members including Algeria, Egypt, Tunisia, Morocco,

[155] Ecorys and Consortium Partners (2014), Study in support of Impact assessment work on Blue Biotechnology, https://webgate.ec.europa.eu/maritimeforum/sites/maritimeforum/files/Blue%20Biotech%20-%20Final%20Report%20final.pdf

[156] ULIXES project: http://cordis.europa.eu/project/rcn/97824_en.html

[157] The Mediterranean Science Commission: http://www.ciesm.org

Lebanon, Syria, Turkey and Montenegro, as well as the main Northern Mediterranean countries. Among its activities, the Commission promotes communication and cooperation among marine scientists, for instance, by organizing research workshops. The 2000 researchers working for the CIESM are divided in 6 committees: marine geosciences, physics and climate of the ocean, marine biogeochemistry, marine microbiology and biotechnology, marine ecosystems and living resources, coastal systems and marine policies.

### 7.1.3. Challenges and Outlook

On a global scale, interest in bioprospecting is growing: patent applications related to marine genetic resources have been increasing at rates exceeding 12% a year in recent years[158].

In the Mediterranean, where bioprospecting is underdeveloped, it is likely that the midterm development of the sector will have a negligible impact on the region's economy. The Mediterranean Sea, however, has an enormous potential for bioprospecting, especially due to its numerous extreme environments such as thermal or sulphur vents and hypersaline intrusions at depth of 2000 meters or more, which are considered of great value for Blue Biotechnology[159]. However, the cost of prospecting in such deep environments is extremely high: the vessels and platforms used are very expensive to operate.

Bioprospecting in the Mediterranean could however be fostered through several channels such as:

- Increased coordination between academic and industry partners, working on common projects;
- Easier access to finance: especially through publicly funded investment in R&D to increase knowledge on the ecology of marine species and organisms;
- Development of a regulatory framework that secures intellectual property rights;
- Elaboration of regional policies on marine biotechnology;
- Technical development of bio-engineering tools.

If the sector is to develop, it should implement policies and regulations to control the sector, and apply precautionary principles, if necessary, in order to meet SDG 14.2 "*By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans*".

[158] World Bank (2017), The Potential of Blue Economy – Increasing long-term benefits of the sustainable use of marine resources for small island developing States and coastal least developed countries, https://openknowledge.worldbank.org/bitstream/handle/10986/26843/115545.pdf?sequence=1&isAllowed=y
[159] Ecorys and Consortium Partners (2014), Study in support of Impact assessment work on Blue Biotechnology, https://webgate.ec.europa.eu/maritimeforum/sites/maritimeforum/files/Blue%20Biotech%20-%20Final%20Report%20final.pdf

## 7.2. Deep-sea Mining

### 7.2.1. Overview

According to the OECD definition, marine and seabed mining are "*the production, extraction and processing of non-living resources in seabed or seawater*"[160]. Most minerals and metals are found in the deep-sea, in three types of deposits: polymetallic nodules, polymetallic sulphides and cobalt-rich crusts. Exact details of the resources are not known, but these deposits could contain significant quantities of minerals such as copper, zinc, nickel, lead, indium, gold and silver.

Deep-sea mining is attractive in that it could help meet the increasing demand for minerals, especially "high-tech" ones (e.g. cobalt, platinum, rare earths or titanium). Moreover, deep-sea mining can reduce a country's dependence on imported resources. The European economy is, for instance, more than 90% dependent on metal imports[161].

Deep-sea mining could also be more profitable than surface and underground mining, especially given higher concentrations of minerals[162]. However, as discussed below, there are many unknown and potential environmental issues when it comes to deep-sea mining. One should also keep in mind that onshore mining is not considered as part of a Green Economy, therefore it is questionable if offshore mining should be considered a sustainable Blue Economy activity.

### 7.2.2. Current status

Worldwide, around 50 exploration licences for deep-sea mining have been granted. Only two projects so far have been granted a mining licence: Solwara 1 in **Papua New Guinean** and Atlantis II in the **Red Sea**, even though extraction has not started yet in either of the two. The highest potential resources are found in the Pacific Ocean, especially in the Clarion-Clipperton fracture zone. It has been estimated that nodule deposits in that area could contain 6,000 times more thallium, and three times more manganese, nickel and cobalt than the entire proven land resources[163].

On the other hand, there is almost no deep-sea mining activity in the Mediterranean, apart from an exploration project that has been submitted by the company Neptune Minerals **in Italy, in the Tyrrhenian Sea**. This project concerned Seafloor Massive Sulphides (SMS) located at a depth of 500 to 1000 meters[164].

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[160] OECD (2016), The Ocean Economy in 2030, https://unstats.un.org/unsd/class/intercop/expertgroup/2017/AC340-Bk8.PDF

[161] Dyment (J.) et al. (June 2014), Impacts environnementaux de l'exploitation des ressources minérales marines profondes, Collective Scientific Expertise, CNRS-Ifremer, http://www.cnrs.fr/inee/recherche/docs/RAPPORTEXPERTISE_VF.pdf

[162] Ifremer (2011), Les ressources minérales marines profondes : Synthèse d'une étude prospective à l'horizon 2030, http://www.mineralinfo.fr/sites/default/files/upload/documents/synthese_remima_-_version_finale_-_bd.pdf

[163] Pangrazzi (C.) (March 2016), Le domaine maritime de la France vient de s'agrandir – Pourra-t-on exploiter les richesses des fonds marins ?, Ca m'intéresse, http://www.azimutetvous.eu/Site-ESP/ESP-docG/E_pourra-t-on_explorer_les_richesses_sous-marines.pdf

[164] Ecorys and Consortium Partners (2014), Study in support of Impact assessment work on Blue Biotechnology, Annex 5 https://webgate.ec.europa.eu/maritimeforum/sites/maritimeforum/files/Annex%205%20Ongoing%20and%20planned%20activity_rev.pdf

The exploration licence was granted in 2007, but Neptune Minerals has not applied for an exploitation licence since then. However, due to the potential of seabed mining, several research projects are underway, including in the Mediterranean Sea. This is the case of the **MIDAS project**, whose aim is to better assess and understand the environmental impacts of deep-sea mining (see below).

The slow development of these activities can be explained by the low technological development, as well as a lack in the regulatory system. Most importantly, there is too little understanding of potential environmental and social impacts.

### 7.2.3. Challenges

The state of knowledge regarding the deep-water biodiversity is very low. As a result, the impacts of mining on marine ecosystems are poorly understood so far. Similarly, the ecosystems' faculty to recover after mining operations and the resulting disruption is not known.

Deep-sea mining could have several harmful environmental consequences: destroying deep-sea ecosystems, stirring up potentially toxic sediment plumes, impacting species because of the noise, vibration and light induced, or through waste management. Moreover, deep-sea mining can also affect local communities by disturbing fishing or tourism. The potential impacts of deep-sea minerals exploitation are summarized in the following diagram:

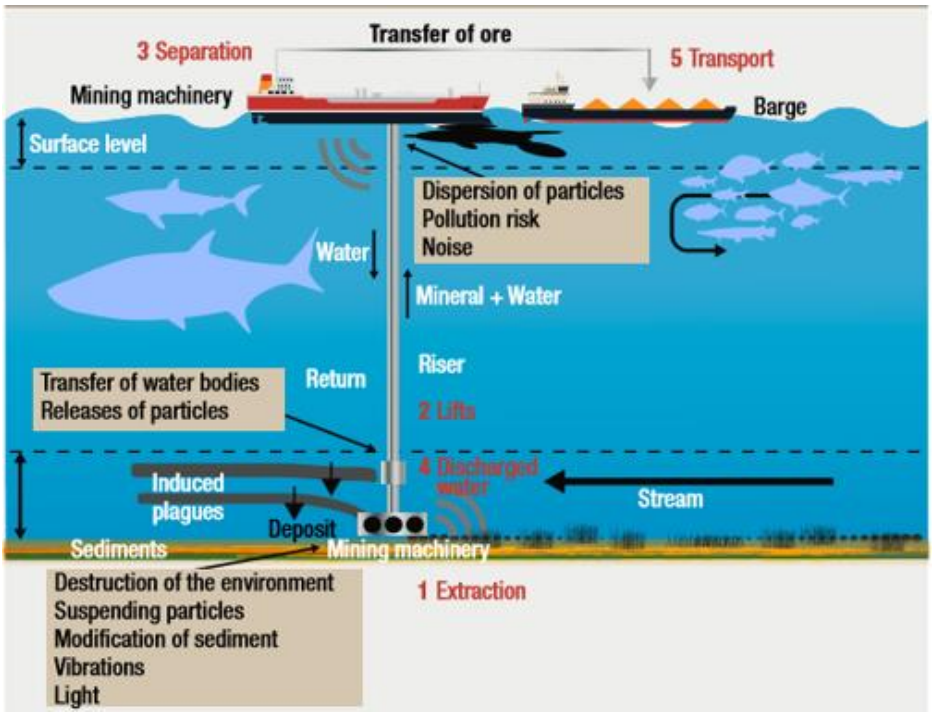


**Figure 33: Environmental Impacts of deep-sea mining (Amundi Discussion Papers Series, 2017)[165]**

[165] Navarre M., Lammens H. (2017), Opportunities of deep-sea mining and ESG risks, Amundi Discussion Papers Series, http://research-center.amundi.com/page/Publications/Discussion-Paper/2017/Opportunities-of-deep-sea-mining-and-ESG-risks

To address those challenges, the **MIDAS** (Managing Impacts of Deep-seA reSource exploitation) project[166], partly funded by the European Union, ran from 2013 to 2016. The project covered several sites, including in the Mediterranean. Its goal was to better understand the environmental impacts implied by deep-sea mining, focusing on the physical destruction of ecosystems on the ocean floor, as well as the impacts of sediment plumes and toxic chemical products than can be released during mining. It also intended to fill some knowledge gaps, such as connectivity between species, or how ecosystems can recover from mining.

Thanks to the research, a set of recommendations on good practices for the mining industry has been elaborated to enable relatively sustainable deep-sea mining. It is, for instance, recommended to create conservation zones and zones of environmental interest where mining would not be allowed. With the collaboration with European and international regulatory bodies, these recommendations should be translated into regulations.

### 7.2.4. Outlook

Worldwide, only two projects (in Papua New Guinea and in the Red Sea) will start the exploitation of deep-sea mineral resources in the near future. The project Solwara 1 in Papua New Guinea is expected to start operations at the beginning of 2019.

However, deep-sea mining probably does not represent a great opportunity for Mediterranean countries. In fact, this region has a rather low resources potential, particularly when compared to other locations such as the Pacific Ocean. Some potential resources have been identified in Italy and the Eastern Mediterranean.

If the first extraction projects are a success, deep-sea mining activities could become particularly attractive for industries. A recent study has shown the potential for companies working in the oil & gas supply chain in Italy to turn to deep-sea mining, as there are substantial overlaps in the exploration and production phases[167]. And even though deep-sea mining could potentially generate high revenue streams, it is not likely to create many jobs as a great part of the work would be done by robotic machines.

In any case, a **precautionary approach** should be used due to the uncertainties regarding the potential environmental and social impacts. The development of environmental legislations by states (for areas located in their Exclusive Economic Zone) and by the International Seabed Authority (for international waters located at more than 200 miles from a State's baseline) will be key. A truly sustainable Blue Economy would be based on the concept of a **circular economy**, avoiding any kind of new extraction from the Earth's crust.

[166] MIDAS project: http://www.eu-midas.net/
[167] Keber M. et al. (2017), Deep Sea Mining: An Opportunity for the Italian Offshore Industry?, https://www.onepetro.org/conference-paper/OMC-2017-761

# Conclusions

When analysing the key sectors of the Blue Economy, a few key findings related emerge:

In terms of **employment and GDP contribution**, the **tourism** sector is clearly the dominating one, far larger than all the other sectors combined. This may be different at a local level (e.g. areas with large commercial ports) but over the entire Mediterranean the tourism industry is today the leading blue economy sector. Human activities in the fields of **maritime transport** and **fisheries/aquaculture** have considerable impact on the Mediterranean environment and the economies of its coastal states. Offshore **renewable energy** has a large potential, but has not yet emerged in the region. By contrast, it is not yet clear what the real potential of **bioprospecting**, if any, will be for Mediterranean States. And for a sector like **deep-sea mining**, with no activity at all in the Mediterranean, it can be questioned if it should be part of a sustainable Blue Economy at all.

With regards to **sectorial interlinkages**, all sectors interact to a varying degree with each other as they are all are based in the same environment. However, the sector which interlinks to the largest extent with the others is the **tourism** sector. Tourists – similar to the local population – demand transport services, goods, energy, and often fish and sea food. An increase in the tourism sector will almost automatically create growth in the other sectors (except in bioprospecting), which is not the case for the other sectors (e.g. more renewable energy usually does not attract more tourists). Therefore, it is essential to especially focus on the sustainable development of this sector – as well as on local communities – in order to avoid negative consequences in the others.

When it comes to the **regional perspective**, the **EU countries** represent today the majority of Blue Economy activities. **SEMC** may be strong in certain aspects, e.g. shipbuilding in Turkey, or locally, e.g. ports or certain tourist destinations. Therefore, transparent and efficient mechanisms to ensure knowledge and investment transfer should be promoted from the North to the South, through regional cooperation programs, use of climate finance mechanisms (GCF, etc.) but also though the active contribution of private financial sector and businesses, as well as the South-South financial flows.

When analysing the Blue Economy sectors, we can see that **the impacts on the environment and on local communities** depend largely on the actions and practices adopted by individual countries, although strengthened **cooperation** at the Mediterranean basin level, as advocated by Ministers in the UfM Blue Economy Declaration, would also improve conditions for developing the Blue Economy in the region. The development of Blue Economy activities should therefore be closely monitored to mitigate negative environmental externalities and to increase the socio-economic benefits to the whole value chain, including small businesses, hinterland territories and local citizens. Emphasis should be put on extending the revenue **from the coastal cities to rural villages** to insure social inclusiveness, fight against depopulation and reduce environmental pressures. This is the only way that the Blue Economy can contribute to the progress and well-being of all actors and stakeholders in the region.

The Blue Economy sectors are still far from what would be required in the true sense of long-term sustainability. A number of promising initiatives, projects and technologies exist but a lot needs to be done so that they become common practice. It will be the role of policy makers to drive the Blue Economy sectors in the direction of sustainable development based on the existing **institutional sustainability commitments**. The Paris Agreement, the SDGs and other regional (Barcelona Convention) and global frameworks (e.g. Convention on Biological Diversity) are key drivers towards this achievement. However further efforts should be put into developing a **Mediterranean Strategy on Sustainable Blue Economy**, based on the outcomes of the Western Mediterranean Maritime Initiative[168], the Mediterranean Strategy for Sustainable Development (MSSD), the Sustainable Consumption and Production Action Plan for the Mediterranean (SCP AP) and in general the Barcelona Convention.

[168] Western Mediterranean Maritime Initiative: http://www.westmed-initiative.eu/

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