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Assessment on improving human resources for Blue careers

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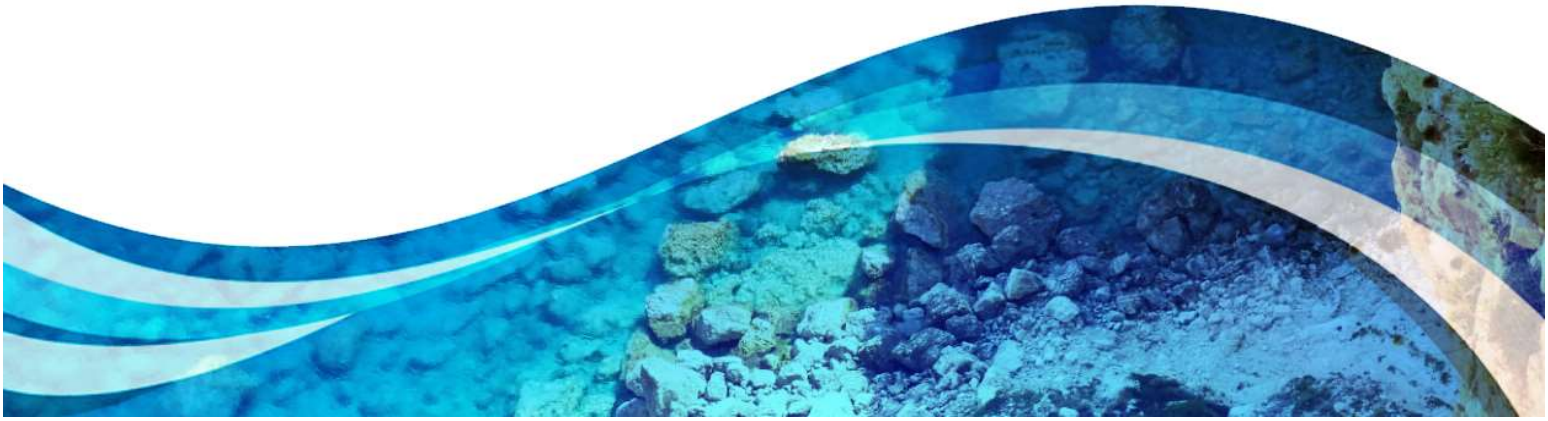

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CONTENTS

EXECUTIVE SUMMARY / ABSTRACT

A preliminary assessment on improving human resources for blue careers, has been carried out for the 9 European Mediterranean countries, as well as for the 14 non-European Mediterranean countries. Document contains inventory of national tools for training and capacity building that are related to Blue Growth issues. Analysis conducted is based on available literature and on documents or data received from the stakeholders from these countries.

There is clear evidence that projects related to higher education and research and financed by the EU over past decades facilitated communication between different research groups and countries and resulted in establishment of different formal and informal networks. This has in term contributed to scientific excellence and exchange of ideas, although there are still great possibilities for integration and collaboration.

Institutions, professors and researchers working in the Mediterranean region have very good capabilities to address issues related to Blue Growth. Challenges are related to their capacities to complete all task related to continuously increasing workload, both in terms of expectations related to scientific productivity, professional work as well as administrative assignments. Furthermore, there are challenges related to recruitment of young researchers as doctoral and postdoctoral positions are quite limited in almost the entire Mediterranean region, resulting in most perspective students and young professors leaving the region, which has potential long term negative effects on this region.

The document provides an overview of the present common practices for training and capacity in the Mediterranean countries. Furthermore, it links human resources' practices to four BLUEMED platforms including Knowledge, Economy, Technology and Policy.

SCOPE

BLUEMED aims at creating the conditions for extending and sharing initiatives between EU countries, as well as between EU countries and non-EU countries. Gaining understanding of the common practices for training and capacity in different countries and that are related to Blue Growth issues is an important part of the BLUEMED project and can serve the scopes of the BLUEMED Initiative key policy documents, from the Venice Declaration (http://www.bluemed-initiative.eu/wp-content/uploads/2017/02/Venice-Declaration-final.pdf) to the Valletta Declaration (http://www.bluemed-initiative.eu/wp-content/uploads/2017/05/Declaration_EuroMed-Cooperation-in-RI_1772.pdf) to the report of the BLUEMED high level conference on (http://www.bluemed-project.eu/wp-content/uploads/2017/09/BLUEMED-Conference-Malta-18-19-April-2017-Report_final.pdf) and the technical level meeting on Strenghtening Euro-Mediterranean Cooperation through Research and Innovation (http://www.bluemed-initiative.eu/wp-content/uploads/2017/10/summary-of-BLUEMED-techcnical-meeting-on-3-MAy-BH-150520172.pdf), addressing the skill's enhancement, as one of the main enablers of the blue growth in the Mediterranean.

This documents is a preliminary analysis of existing common practices for training and capacity programs related to Blue Growth issues in the EU and non-EU countries located on the shores of the Mediterranean Sea. It contains data on education systems and programs in different countries and provides overview of opportunities and challenges for the individual countries surveyed, as well as for the region as a whole.

1. Inventory of national tools for training and capacity building

EU countries:

1.1 Croatia

In the Republic of Croatia, higher education is supervised and accredited by the Agency for Science and Higher Education (www.azvo.hr). Information presented below was extracted from the following web page - mozvag.srce.hr/preglednik/pregled/en/tipvu/odabir.html, accessed on September 5th 2017.

There are total of **8 public Universities** in the Republic of Croatia including University of Zagreb (www.unizg.hr), Josip Juraj Strossmayer University of Osijek (www.unios.hr), University North (www.unin.hr), Juraj Dobrila University of Pula (www.unipu.hr), University of Rijeka (www.uniri.hr), University of Zadar (www.unizd.hr), University of Split (www.unist.hr), and University of Dubrovnik (www.unidu.hr). Out of these, **five** Universities **are located in coastal cities** including Pula, Rijeka, Zadar, Split and Dubrovnik, and have strong orientation toward **Blue Growth issues**. Furthermore, due to programs offered and research expertise, University of Zagreb, located in the capital, has several programs related to Blue Growth issues.

There are **11 public Polytechnic institutions**, out of which **2 are located in coastal cities**: Polytechnic of Rijeka (www.veleri.hr) and Polytechnic of Šibenik (www.vus.hr).

There are **27 private institutions** of higher education in Croatia, most of them are located in Zagreb and many of them are business or theology oriented. Private higher education institutions in coastal cities include: College for Technology and Business – Pula Polytechnic (www.politehnika-pula.hr), Business College „PAR“ (Rijeka, www.par.hr), College for Inspection and Personnel Management (Split, www.vsikmp.hr), College of Management and Design “Aspira” (Split, www.aspira.hr), TV Academy – College of Multimedia and Communication in Split (Split, www.tv-akademija.com) and RIT Croatia (Dubrovnik, www.croatia.rit.edu).

List of public Universities with indicated number of subjects of study, number of employed scientists and number of employed teachers is presented in Table 1. It is clearly evident that by far the largest higher education institution in the Republic of Croatia is the University of Zagreb, which employs 55% of teachers employed at all public Universities. Second and third by size by number of teachers and scientists among them are Universities of Split and Rijeka. Although in the past years, efforts have been made to de-centralize higher education and strengthen University in other cities, higher education in Croatia is still highly dominated by the capital.

Table 1.1: Public Universities in the Republic of Croatia with indicated number of subject areas of study, number of employed teachers that are scientists, and a total number of teachers. Data from mozvag.srce.hr/preglednik/pregled/en/tipvu/odabir.html, accessed on September 5th 2017.

Institution	Location	N subject of study	N of employed scientists	N of employed teachers
University of Zagreb	Zagreb	73	3739	5459
Josip Juraj Strossmayer University of Osijek	Osijek	41	769	1092
University North	Koprivnica	10	82	92
Juraj Dobrila University of Pula	Pula	12	125	173
University of Rijeka	Rijeka	35	799	1172
University of Zadar	Zadar	24	259	425
University of Split	Split	50	932	1370
University of Dubrovnik	Dubrovnik	13	98	151

According to the same source, there is total of **1148 University programmes** currently accredited in the Republic of Croatia. Out of these 350 are undergraduate university programmes, 54 are integrated undergraduate and graduate university programmes, 387 are graduate university programmes, 231 postgraduate specialist university study programmes, and 126 are postgraduate doctoral programs. Furthermore, there is a total of **251 professional programs** that are accredited. Among these, there are 2 short professional study programmes, 169 undergraduate professional programmes, and 80 specialist graduate professional programmes. Many of these programs developed as a part of the Bologna Process. Due to large number of high education programs, both University and professional ones, it is very difficult to assess them, in relation to Blue Growth. Below is an overview of most important sectors in Croatia that are currently important and have further potential for Blue Growth and some of the high education programs related to them.

According to EUNETMAR Country fiche for Croatia produced in year 2014 (https://webgate.ec.europa.eu/maritimeforum/sites/maritimeforum/files/Croatia_cf.pdf) most relevant and promising marine and maritime activities in Croatia are: coastal tourism, cruise tourism, passenger ferry services, short-sea shipping (incl. Ro-Ro), yachting and marinas, and marine aquaculture. According to the same document, there is a good standard for schooling for all of these activities and for most of them barriers to growth that are related to education have not been identified. In case of passenger ferry

service and short-sea shipping, difficulties to hire have been identified as barriers to growth.

Croatia has a strong tourism orientation, with tourism income surpassing 18% of countries GDP in 2016, which is by far the highest in Europe (HGK, 2017, www.hgk.hr/documents/aktualna-tema-turizam-u-20165899d9633ad81.pdf).
According to strategy for tourism development in Croatia (http://narodne-novine.nn.hr/clanci/sluzbeni/2013_05_55_1119.html) it is expected that earnings from tourism will continue to increase. To secure this growth, as well as make it sustainable, country needs to rely on different professional programs. Currently, several institutions have study programs that are directly related to tourism (e.g. Tourism, Tourism management, Tourism marketing, Hospitality management, etc.) and they are located in all major cities on the coast, as well as inland. Public high education institutions with programs related to tourism include Faculty of Tourism and Hospitality Management (Opatija), University of Zadar,Faculty of Economics- University of Split,University of Dubrovnik, Juraj Dobrila University of Pula, Faculty of Economics and Business–University of Zagreb, Polytechnic of Šibenik, Međimurje Polytechnic in Čakovec, and College for Management in Tourism and Informatics in Virovitica. Furthermore, several private institutions also offer programs in this area including - RIT Croatia (Dubrovnik), VERN Polytechnic (Zagreb), Libertas International University (Zagreb), and College of Management and Design "Aspira" (Split). The interest in this type of education is clearly evident from the very high number of institutions and programs and which they are available from undergraduate level to doctoral studies. Besides these, there are numerous study programs in economics, different natural sciences, traffic and transportation engineering, computer sciences, naval architecture, biotechnology, visuals arts, medicine, dental medicine, languages, history of art, and other disciplines that are crucial support for tourism industry.

Ship building and **sea traffic** have long term tradition in Croatia. Study programs in Naval Architecture are offered at Universities of Zagreb, Rijeka and Split. Furthermore, these and other institutions offer maritime study programs in Nautical Studies, Marine Transport Logistics and Management, Yacht and Marina Technologies, Marine Engineering, Electronic and Information Technologies, etc. Programs are offered at different levels of study at the Universities of Rijeka, Split and Dubrovnik. Also, a number of private centres offer different maritime training, seafarers education and training, STCW 95 courses, crewing agency, retraining, and gaining all certificates required for international navigation. Additionally, they are equipped with the Full Mission type simulators, that it has been recognised as being capable of simulating all environments.

The fFisheries and aquaculture sector is also very important in Croatia. Although its contribution in country's GDP is <1%, is an important segment due to export, employment in coastal areas, support to tourism industry and overall local economy. Higher education programs related to fisheries and aquaculture include: undergraduate studies of Aquaculture (University of Dubrovnik) and Marine Fisheries (University of Split), and graduate programs in Mariculture (University of Dubrovnik) and Marine Fisheries (University of Split). New graduate study in Sustainable Management of Aquatic Resources (BLUE SMART) is starting at the University of Zadar in Academic year 2017/18. This program has been financed as a part of a call on "Blue careers in Europe". Further on, faculty of Agriculture at University of Zagreb offers several programs that have segments related to marine aquaculture and fisheries. Juraj Dobrila University of Pula in collaboration with Ruđer Bošković Institute (Zagreb-Rovinj) offers

undergraduate program in Marine Sciences. People interested in this field continue their education by enrolling to PhD program in Applied Marine Sciences (Universities of Split and Dubrovnik), Biology (University of Zagreb), Oceanology (University of Zagreb) or Agricultural Sciences (University of Zagreb). Undergraduate and post graduate research experiences are taking place at different institutions including Institute of Oceanography and Fisheries (Split). There is no undergraduate professional study programme in fisheries and aquaculture.

Overall, high education programs offered in Croatia **provide baseline for BLUE GROWTH issues**. The number of programs offered and the number of institutions, both private and public, is quite impressive. There are certain concerns that there is lack of integration within and between institutions. Specifically, despite the Bologna Process, it is still logistically quite demanding to take courses from different faculties within individual universities, and even more between different universities. Furthermore, there are only several programs carried out by more than one issuing institution and these include undergraduate university study programme in Mediterranean Agriculture (Universities of Split and Zagreb), PhD in Applied Marine Sciences (Universities of Split and Dubrovnik), and postgraduate specialist university study program in Medical Tourism (different Faculties within University of Rijeka). Sustainable BLUE GROWTH requires interdisciplinary approach, and the majority of study programs offered are not interdisciplinary.

Although, when the study programs were re-written as a part of Bologna process, they often included significant practical components and contribution of lecturers/professors from different institutions (including international ones), due to financial and organisational constrains were often not implemented. Practical experiences offered to students vary between institutions, but are often quite limited. Private institutions, especially those related to tourism, are exception in this. Significant efforts should be made to link education programs with others in the EU and to provide ways for exchange of staff, besides the short term visits that are currently taking place in a framework of ERASMUS+ programs.

There is high potential for creation of online courses that needs to be explored in the future. Additionally, short programs, such as summer schools, could provide important framework for the creation of joint programs and staff/student exchange.

1.2 Cyprus

The higher education system in Cyprus follows Bologna Process and is integrated in European Higher Education Area (www.highereducation.ac.cy/en/). It consists of public and private institutions. Over the last fifteen years the number of students in Cyprus has been increasing rapidly. However, still large proportion of Cypriot students are studying abroad. There are three public Universities: The University of Cyprus, the Cyprus University of Technology and the Open University of Cyprus. Further on, there are five private Universities: European University, Frederick University, University of Nicosia, Neapolis University, and University of Central Lancashire. Next, there are a number of State Higher Education Institutions in Cyprus that also provide higher education, and none of them has a university status. Currently there are registered 43 private institutions of higher education, offering academic and vocational programs of study.

Examples of programs include undergraduate and postgraduate degrees related to Blue Growth are listed below:

EDUCATION

Technological University of Cyprus

Faculty of Management and Economics

Department of Hotel and Tourism Management

Undergraduate Programme of Studies, Hotel in Tourism and Management Degree
http://www.cut.ac.cy/htm/degrees/?languageId=2

Postgraduate Programmes, MSc in International Tourism and Hospitality Management,
http://www.cut.ac.cy/htm/degrees/postgraduate/

Department of Commerce, Finance and Shipping

Undergraduate Programme of Studies, Degree in Commerce Finance and Shipping,
http://www.cut.ac.cy/cfs/studies/

Faculty of Geotechnical Sciences and Environmental Management

Department of Environmental Science and Technology

Undergraduate Programme in Environmental Science and Technology,
http://www.cut.ac.cy/est/studies/?languageId=2

Master of Science in Energy Resource Management,
http://www.cut.ac.cy/est/postgrad/EnergyResources/

Master of Science in Environmental Bioscience and Technology,
http://www.cut.ac.cy/est/postgrad/EnvScience/

Department of Civil Engineering and Geomatics

Master of Science in Geoinformatics and Geospatial Technologies, http://www.cut.ac.cy/ceg/postgrad/geoinformatics/

Master of Science in Civil Engineering and Sustainable Planning, http://www.cut.ac.cy/ceg/postgrad/?languageId=2

Frederick University

Relevant courses offered by the School of Economic Science and Administration-Department of Maritime Studies

Maritime Studies, http://www.frederick.ac.cy/school-of-economic-sciences-and-administration-programs-of-study/bsc-in-maritime-studies

International Trade and Shipping Management, http://www.frederick.ac.cy/school-of-economic-sciences-and-administration-postgraduate-programs/msc-in-international-trade

University of Cyprus

Oceanography Center - Research Center, http://ucy.ac.cy/oceanography/en/welcome-message

Department of Biological Sciences offers Marine Biology among other relevant subjects, http://www.ucy.ac.cy/biol/en/academicprogramms/undergraduate

University of Nicosia

School of Business – Department of Tourism, Leisure and Events Management

Tourism, Leisure and Events Management, https://www.unic.ac.cy/schools/school-business/department-hospitality-tourism-and-sports-management/tourism

European University

The School of Business Administration

Hotel, Tourism and Event Management, http://www.euc.ac.cy/easyconsole.cfm/id/173/dep/162/program_id/153/lang/en

School of Sciences offers Marine Biology within the course of Biological Sciences, http://www.euc.ac.cy/easyconsole.cfm/id/176/dep/3283/program_id/133/lang/en

UCLAN

School of Business and Management

Undergraduate Programme in Hospitality and Tourism Management, http://www.uclancyprus.ac.cy/en/courses/schools-business-management/undergrauate-courses/bahons-hospitality-and-tourism-management/

FISHERIES AND AQUACULTURE

Department of Fisheries and Marine Research,
http://www.moa.gov.cy/moa/dfmr/dfmr.nsf/page02_en/page02_en?OpenDocument

Fisheries Resources,
http://www.moa.gov.cy/moa/dfmr/dfmr.nsf/page10_en/page10_en?OpenDocument

Aquaculture,
http://www.moa.gov.cy/moa/dfmr/dfmr.nsf/page11_en/page11_en?OpenDocument

Marine Environment,
http://www.moa.gov.cy/moa/dfmr/dfmr.nsf/page13_en/page13_en?OpenDocument

Naval Service,
http://www.moa.gov.cy/moa/dfmr/dfmr.nsf/page15_en/page15_en?OpenDocument

SHIPPING

Department of Merchant Shipping,
http://www.mcw.gov.cy/mcw/dms/dms.nsf/cypmarcentre_en/cypmarcentre_en?OpenDocument

1.3 France

a) Introduction and national context

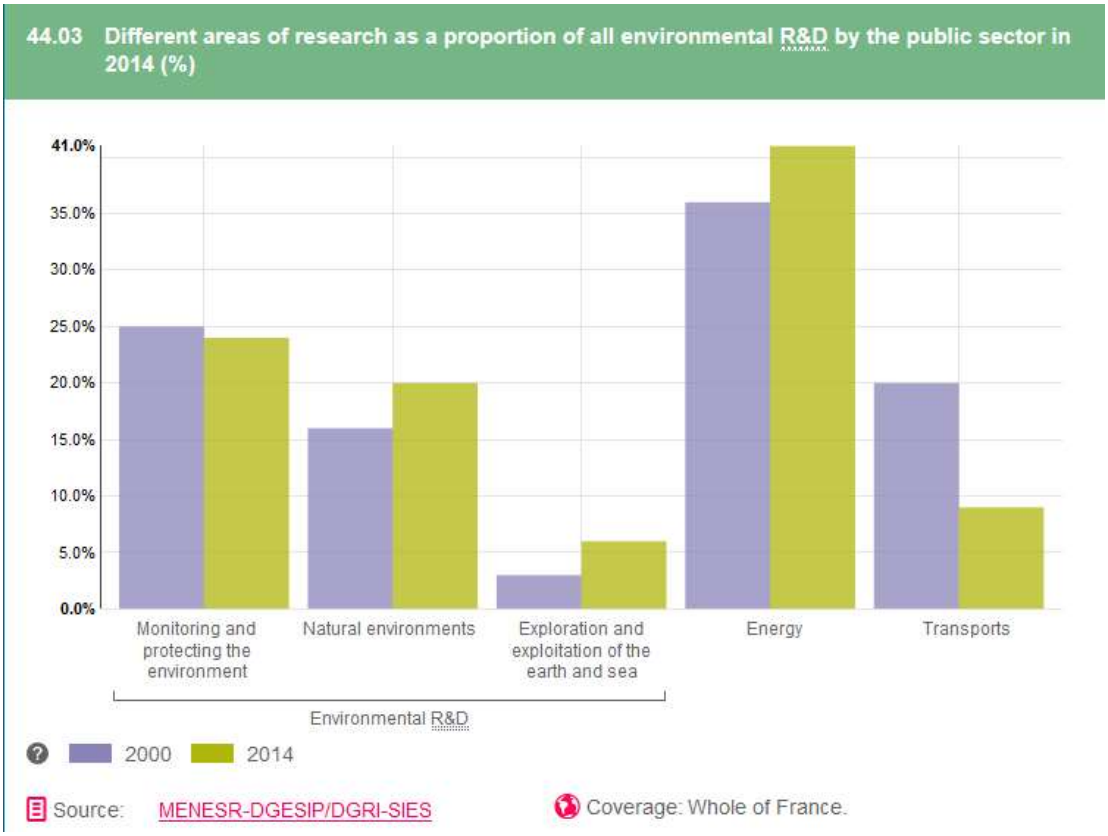
Amoung the population, more than 2.5 million of people are enrolled in higher education. Out of ten students, six are enrolled at university, in a public institution[1]. In 2016, 43% of students are enrolled in vocational educational training[2]. France has 73 public universities, 224 engineering schools, 220 business schools, 291 PhD schools and 1200 research laboratories. One third of all PhD thesis is written by a foreign student[3]. *Every year, 100 000 foreign students graduate from French higher education system*[4]*.*

In 2016, 31.8% of adults aged 30-34 have a higher education qualification (38.5% in the EU) and 18% of adults are enrolled in lifelong learning (11% in the EU)[5]. 50.2% of French employers say they encounter difficulties in finding employees with the right skills (40% in the EU) and 76% of companies are financing training to their employees (66% in the EU). 67% of high skilled people and 26% of low skilled people are enrolled in a training for professional reasons[6]. In 2017, 21.8% of the population aged 15-24 and 8.7% of the people aged 25-49 is unemployed[7]. In 2016, 50.4% of low skilled young people and 80.4% of high skilled young people have a job[8].

In 2014, R&D expenditure devoted to environmental issues was estimated to reach €5 billion, equivalent to 11% of France's gross domestic expenditure on R&D. 51% of expenditure dedicated to environmental research and development, excluding energy and transport, was incurred by businesses; *it was only 20% in 2000*[9]**.**

According to the chart below, R&D expenditure devoted to earth and seas has doubled in 2014 compared to the year 2000.

[1] http://www.insee.fr/fr/statistiques/2492171?sommaire=2492313
[2] http://ec.europa.eu/social/keyDocuments.jsp?langId=en&mode=advancedSubmit&advSearchKey=SkillsAgendaFactsheets
[3] http://www.maroc.campusfrance.org/page/panorama-de-lenseignement-superieur-francais-et-de-ses-diplomes-0
[4] http://ressources.campusfrance.org/publi_institu/agence_cf/focus/fr/focus_portugal_fr.pdf
[5] http://ec.europa.eu/social/keyDocuments.jsp?langId=en&mode=advancedSubmit&advSearchKey=SkillsAgendaFactsheets
[6] http://ec.europa.eu/social/keyDocuments.jsp?langId=en&mode=advancedSubmit&advSearchKey=SkillsAgendaFactsheets
[7] http://www.insee.fr/fr/statistiques/2851776
[8] http://ec.europa.eu/social/keyDocuments.jsp?langId=en&mode=advancedSubmit&advSearchKey=SkillsAgendaFactsheets
[9] *http://publication.enseignementsup-recherche.gouv.fr/eesr/10EN/EESR10EN_R_44-environmental_research_and_development.php*



Source: http://publication.enseignementsup-recherche.gouv.fr/eesr/10EN/EESR10EN_R_44-environmental_research_and_development.php

*Various prestigious universities and research centers are located in France. France has developed excellent **knowledge** in various domains related to the sea (**observation**, coastal management, **ecosystems**…).*

*In 2017, 22% of French national waters, including overseas, are protected and have the status of **marine protected areas**. France has the second largest surface of national waters in the world (the first being the USA)*[10]*, with 11 million of km²*. This area is the shelter for 10% of worldwide coral reefs, 20% of atolls, 6% of seamounts, and a very large biodiversity[11].

Furthermore, France is committed to achieve the objectives of the Marine Strategy Framework Directive (2008/56/CE)[12] by 2020, i.e. to achieve and maintain a good ecological state of the marine environment. This strategy was transposed into the national law of 12 July 2010 known as the "Grenelle 2 Law", and into the national Decree No. 2011-492 of 5 May 2011 on the elaboration and implementation of the "**Action Plan for Marine Environment**". This action plan is concerning the Channel, Atlantic and Mediterranean Seas and will provide a quality assessment of marine waters and the environmental impact of human activities; it will also set environmental objectives and associated indicators, in order to achieve the overall objective of the Marine Strategy

[10] http://www.aires-marines.fr/Les-aires-marines-protegees/Carte-interactive
[11] http://www.aires-marines.fr/Les-aires-marines-protegees/Contexte-global
[12] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:164:0019:0040:EN:PDF

Framework Directive. The community of researchers in France contributes to this action plan with its large expertise, knowledge and observation skills[13].

The research and academic communities in France are committed to the protection of coastal areas, seas, and the environment in general. Here are some of the many laboratories dedicated to these domains in France:

- French institutions gathered forces to create in 2012 the **Mediterranean Institute of Oceanography** (MIO[14], Institut Méditerranéen d'Océanologie). Partners are the CNRS (National Center of scientific Research-Centre national de la Recherche scientifique), the Institute of Research for Development (IRD, Institut de Recherche pour le Développement), the University of Toulon and the University of Aix-Marseille. MIO has developed its expertise in marine biology, ecology, biodiversity, microbiology, fisheries, physics, chemistry, biogeochemistry and sedimentology. Research is conducted in the fields of oceanic and atmospheric circulation, marine ecosystems, biological functioning in extreme environments and ocean pollution. The laboratory is equipped with many high technology infrastructures such as **AUV gliders and buoys**. Around 50 PhD students are enrolled at MIO;
- The **LabEx** (Laboratoire d'excellence-Excellence laboratory) **CeMEB**[15] (Centre Méditerranéen de l'Environnement et de la Biodiversité-**Mediterranean Center for Environment and Biodiversity**), located in Montpellier, is a state-of-the-art research and training center, gathering expertise and knowledge from different French research institutions: CIRAD (Centre de coopération internationale en recherche agronomique pour le développement-International Cooperation Center in agricultural Research for Development), CNRS, Ecole Pratique des Hautes Etudes (Practical School of Higher Education), INRA (Institut national de la Recherche agronomique-French National Institute for Agricultural Research), IRD, Montpellier SupAgro (higher education institution in agricultural studies), University of Montpellier 1, University of Montpellier 2, University of Montpellier 3. This innovative integrated research and training center is one of the best center for research on biodiversity in Europe. It aims to understand the dynamics and functioning of biodiversity by combining observation, experimentation and modeling; predicting the biological consequences of **global change** using scenarios; and anticipate the evolution of ecological services and human societies. Scientific research are carried on various topics: dynamics of biodiversity, ecology and evolutionary biology, functional role of biodiversity and ecosystem services, health, socio-economics of the environment, biological consequences of global change. Policymakers, local and national public authorities can rely on this expertise to make decisions on coastal and sea management and to develop strategies to achieve a better protection of the environment, for an **effective maritime spatial planning** in the Mediterranean. The CeMEB offers trainings at Bachelor, Master and PhD level. Important research infrastructures are integrated to the CeMEB, like the platform for chemical analysis and the **European Ecotron platform**[16]. This platform offers to national and international researchers access

[13] http://www.aires-marines.fr/Partager/DCSMM
[14] http://www.mio.univ-amu.fr/
[15] http://occitanie.ird.fr/la-recherche/equipements-d-excellence/laboratoire-d-excellence-labex-centre-mediterraneen-de-l-environnement-et-de-la-biodiversite-cemeb
[16] http://www.ecotron.cnrs.fr/

to new technologies and infrastructures like **environmental sensors** and data base, offering **multiple uses and activities**;

- The IFREMER **Biotechnology and Marine Resources Unit**[17], based in Nantes, is dedicated to the development of knowledge and biotechnologies, and to the valorization and optimized use of marine bioresources, aquaculture, micro-algae and fishery products;
- Created in 2004, the IUML[18] (**Institut universitaire Mer et Littoral**-Academic Institute Sea and Coast), based in Nantes, gathers 650 staff including 250 PhD students, representing 19 research units from CNRS, IFREMER, and various French universities based in Nantes, Angers and Le Mans. This multidisciplinary research center is dedicated to research on biodiversity and coastal environment; exploitation and value-adding of marine resources; marine systems, buildings and geomaterials; changes, conflicts and governance of maritime areas. These research priorities have been identified together with the regional authority. Researchers of IUML are experts in various disciplines like history, biology, law, food engineering, economics, biotechnology, geography, sociology, etc. The IUML is equipped with various test facilities for testing wave energy, micro-algae and shellfish cultures, etc.;
- **LOCEAN**[19] (**Laboratoire d'Océanographie et du Climat**: Expérimentations et Approches numériques/Laboratory of Oceanography and Climate: Experiments and numerical Approaches) is a common structure of collaboration between Pierre et Marie Curie University, CNRS, IRD and the National Museum of natural History (Muséum national d'Histoire naturelle, MNHN), located in Paris and in Bondy. LOCEAN offers curricula at Master and PhD levels in various disciplines related to ocean and sea sciences. Research thematics are concerning climate and impacts, biogeochemical cycles and ecosystems, ocean dynamics and interface interactions;
- *The research community is also involved at European and international level. For example, France was involved in 2012-2015 in an **ITN project called « Training Network for Monitoring Mediterranean Protected Area** », that aims* to train young scientists and managers. Partners of the project are five universities, one research centre, one SME; and six other associated partners (four Mediterranean Protected Areas and two SMEs), from France, Italy, Spain, Greece, the UK, Portugal, and the USA. This interdisciplinary training leads to various professional opportunities like taxonomy, ecology, biology conservation, bio-cartography, and socio-economy. The training also includes soft skills like communication science and outreach, as scientists have to raise awareness among citizens[20]*. This project is a good example of strengthening **synergies among scientific research, private sector, policymakers and civil society**.*

b) Sample of available trainings in the blue growth area

French universities and higher education organizations are offering many possibilities in terms of trainings at Bachelor or Master levels in various domains related to blue growth:

[17] http://wwz.ifremer.fr/Recherche-Technologie/Departements-scientifiques/Departement-Ressources-biologiques-et-environnement/Unite-Biotechnologies-et-Ressources-Marines
[18] http://www.iuml-cnrs.fr/fr/
[19] http://www.locean-ipsl.upmc.fr/index.php?lang=fr
[20] http://cordis.europa.eu/project/rcn/101717_en.html

sea sciences, aquaculture, engineering… Teaching language is mostly French, but some trainings are taught entirely in English.

For example, SeaTech[21] is an engineering school entirely dedicated to marine sciences and technologies. The training also includes knowledge in energy, environment, defense, transports, information sciences and technologies. SeaTech is located in Toulon, in the Mediterranean shore, and is part of Toulon University.

SeaTech offers six different paths:

- Maritime engineering
- Engineering in data sciences, information and systems
- Engineering in mechanical innovation for sustainable systems
- Engineering in materials, sustainability and environment
- Engineering in modeling, computational fluid and structures
- Engineering in mechatronic and robotic systems

Research is an important part of SeaTech. Teachers are active members of different laboratories. Students can make internships in laboratories during their studies.

Furthermore, SeaTech is linked to the private sector and has built R&D projects with various entreprises. For example, SeaTech and Technip, Nenuphar, Océanide, Bureau Veritas, IFP and EDF, in collaboration with the Pôle Mer Méditerranée, launched a new prototype of offshore wind turbine: the project Vertiwind is very innovative and offers new opportunities of development for wind turbines, especially in the Mediterranean.

Lastly, SeaTech is equipped with various infrastructures dedicated to teaching and research, like a wave basin, the ocean engineering basin FIRST, a scanning electron microscope, a fast-track prototyping platform and a water flume.

In 2010, 15 French universities specialized in sea sciences gather into one organization called **Universités marines**[22] (Marine Universities). The objectives are research, observation and the training of 3000 students. Students are studying in one of the 87 Master and 27 PhD trainings offered, like oceanography, maritime law, economics, ecology, biology, archeology, etc.

Many MOOCs about ecology offered by French institutions already exist. Most of the courses are taught in French but some of them are also available in English language. The platform FUN-MOOC, the French platform of the Ministry of Higher Education, Research and Innovation that gathers online courses of more than 50 partners in France and abroad, offers many opportunities to learn more about environmental stakes in the whole world. 38 courses related to environment are available on this platform, open to all and free of charge. For example, the Virtual University Environment and sustainable Development (Université virtuelle Environnement et Développement durable) is offering nine different MOOCs related to ecology (biodiversity, renewable energies, climate change…). But only few of the courses are concerning a specific geographic area and none of them are dealing only with blue economy.

Here is a sample of trainings related to blue growth, sea sciences and the Mediterranean offered in France:

[21] http://seatech.univ-tln.fr/
[22] http://www.universites-marines.fr/fr/formations/flyer-formations/leaflet-formations

Bachelors (in French language):

Bachelor: Technical Executive in production and valuation of marine resources
Length: 3 years
Conservatoire national des arts et métiers/National Conservatoire of arts and professions (CNAM)
Institut national des sciences et techniques de la mer CNAM – Intechmer/National Institute of sciences and techniques of the sea CNAM - Intechmer
Cherbourg-en-Cotentin
http://www.intechmer.cnam.fr

Bachelor in Multimodal and international transport operator
Length: 2 years
Conservatoire national des arts et métiers/National Conservatoire of arts and professions (CNAM)
Institut national des transports internationaux et des ports - CNAM - Grand Port Maritime de Marseille (ITIP CNAM)/National Institute of international transports and harbours - CNAM – Grand Port of Marseille (ITIP CNAM)
Marseille
http://www.marseille-port.fr

Bachelor in Professions of protection and management of the environment
Length: 3 years
Faculty of sciences of Montpellier University
http://formations.umontpellier.fr/fr/formations/sciences-technologies-sante-STS/licence-professionnelle-DP/licence-professionnelle-metiers-de-la-protection-et-de-la-gestion-de-l-environnement-program-fruai0342321nprme183-2.html

Professional Bachelor in law, economy, management and logistics, major in management and maritime transports law
Length: 1 year
Grand port maritime de Marseille - Centre de droit maritime et des transports (GPMM-CMDT-AMU)***/Grand Maritime Port of Marseille – Center of maritime and transports law***
Marseille
http://www.cdmt.org

Masters (in French language):

Master 2 in sea and coastal management
Length : 1 year
University of Montpellier
http://cales-new.univ-montp3.fr/fr/index/offre-de-formation/master-lmd-XB/sciences-humaines-et-sociales-SHS/master-2-geographie-amenagement-environnement-et-developpement-program-master-2-geographie-amenagement-environnement-et-developpement-parcours-gestion-des-catastrophes-et-des-risques-naturels/parcours-gestion-des-littoraux-et-des-mers-subprogram-parcours-gestion-des-littoraux-et-des-mers.html

Research Master in Sciences and technologies, major in oceanography and biology and marine ecology
Length: 2 years
Aix-Marseille University (AMU)
Observatory of universe sciences - Pythéas Institute (OSU - PYTHEAS)
Marseille
http://www.pytheas.univ-amu.fr

Master (MS) in Engineering and marine energies
Length: 1 year
Ecole centrale de Marseille/Central School of Marseille (ECM)
Marseille
http://www.centrale-marseille.fr

Master in biodiversity, ecology and evolution (B2E), major in aquatic Bio-resources and ecology in Mediterranean and tropical environment– BAEMT
Length: 2 years
Faculty of sciences
Montpellier University
http://www.masters-biologie-ecologie.com/BAEMT/

University Degree (DU) Specialized Technician in aquaculture
Length: 14 months
Access: high school degree
Montpellier University
http://formations.umontpellier.fr/fr/formations/sciences-technologies-sante-STS/diplome-universite-niv-form-bac-UA/diplome-d-universite-technicien-specialise-en-aquaculture-program-diplome-d-universite-technicien-specialise-en-aquaculture.html

University Degree (DU) Project Manager in aquaculture (Mediterranean and tropical aquatic ecosystems)
Length: 12 months
Access: graduate (high school degree and 4 years of higher education)
Montpellier University
http://formations.umontpellier.fr/fr/formations/sciences-technologies-sante-STS/diplome-universite-niv-form-bac-4-UE/diplome-d-universite-chef-de-projet-en-aquaculture-program-diplome-d-universite-chef-de-projet-en-aquaculture-et-halieutique.html

Master in sea sciences
4 majors: biology and marine ecology; environment-water-coast; marine environment and resources (in English language); sedimentology and paleoceanography
Bordeaux University
http//www.u-bordeaux.fr/formation/2016/PRMA_25/sciences-de-la-mer

Professional Master in law, economy, management, major in maritime transports
Length: 2 years
UFR Droit et de science politique (UFR DSP)/Law and political sciences department

Aix-Marseille University (AMU)
Aix-en-Provence
http://facdedroit.univ-amu.fr

Maritime Engineering degree
Length: 2 years
ENSM, Ecole Nationale Supérieure Maritime
Nantes
2 paths: Eco-management of ships and Deployment and maintenance of offshore systems. Both paths offer classes in protection of maritime environment, management of systems at risks, social sciences, etc. The path Eco-management of ships offers classes in onboard energy optimization, ship discharge treatment, construction – deconstruction, etc.
http://www.supmaritime.fr/ingenieur-specialite-maritime-eco-gestion-du-navire.html

Euro-Mediterranean management and sustainable development
Length: 1 year
Classes include tourism, cultural management, sustainable coastal management, environment, project management etc. dedicated to Euro-Mediterranean area.
Aix-Marseille University (AMU)
Marseille
http://impgt.univ-amu.fr/master-2-management-euro-mediterraneen-developpement-durable

Masters (in English language):

Master of Science in Marine Environment and Resources (MER)
Length: 2 years
Consortium of 4 universities: University of the Basque Country, Spain; University of Southampton, UK; University of Bordeaux, France; University of Liège, Belgium.
Students have to study in (at least 3) different countries.
http://merconsortium.eu/

MSc Maritime - Logistic & business optimisation (Marseille Campus)
KEDGE Business School
Marseille
Status: Institution diploma
Length: 15 months
http://www.kedgebs.com/en/programmes/maritime-commercial-logistics-optimization

c) Case study: Master 2 "Applied Blue Biotechnology" in La Rochelle

In the framework of the project "Blue Careers in Europe" from the European Commission, a second year of a Master degree was created and opened in September 2017 at the University of la Rochelle. The consortium gathers academic organisations (University of la Rochelle, France; the Catholic University of Valencia, Spain; the University of Stirling, UK) and SMEs (Valbiotis, France; Xanthella, UK) and other organizations like the Conference of Peripheral Maritime Regions of Europe (CPMR), France, the Apprenticeship Formation Unit and the Lifelong Training and Employability Department

from the University of la Rochelle and the Interdisciplinary Centre of Marine and Environmental Research/Centro Interdisciplinar de Investigação Marinha e Ambiental (CIIMAR), Portugal.

This new Master is called "Applied Blue Biotechnology Master II" and it is focused on blue biotechnologies and their application particularly in the health, nutrition and aquaculture domains. This training offers students a comprehensive program, including academic and practical knowledge, as well as soft, communication and technical skills. Students will organize awareness-raising activities on blue technologies and ocean literacy for secondary school pupils. The training is strongly work oriented. For instance, a work-linked training of six weeks will be mandatory during the year. Furthermore, the students will contribute to a project led by one of the blue biotechnology industrial partners of the Master. Graduated students will be able to become professionals in the production, extraction, identification and evaluation of marine molecules with biological activities. The training is open to unemployed people or to already working persons willing to further continue their education. SMEs members of the consortium have been involved in the creation of the Master at early stage, in order to build a training that is in line with the private sector's expectations.

Five students are currently enrolled in the "Applied Blue Biotechnology Master II" and this number is expected to double in the next year.

http://formations.univ-larochelle.fr/applied-blue-biotechnology-master

1.4 Greece

Greece's geostrategic position in the Mediterranean and the Adriatic Sea rebounds to characterize the country as a sea crossroads between Europe, Africa and the Asia, opening up prospects for cooperation and economic growth.

Education

Greece has a fairly high tertiary education attainment rate at 40.4 % in 2015, slightly above the EU average of 38.7 %. However, a large gender gap persists, with females outperforming males by 10.2 pps. in 2015. Foreign-born students have a much lower participation rate than native born[23].

There are in total **18 public Universities**, **2 public Technical Universities and 14 public Universities of Applied Sciences,** which along with education are also promoting basic and applied research. Most of the above Universities have postgraduate programmes including programmes of Doctoral diplomas and participate in several research programmes. As far as Blue Growth is concerned, there are some targeted postgraduate courses with the possibility of doctoral dissertation in several faculties. Indicatively, the table below is presented (Table 1.4).

Table 1.4: Indicatively Postgraduate programmes related to Blue Growth issues.

University	Postgraduate programme related to Blue Growth	Details
National Technical University of Athens	Water Resources Science and Technology	http://devel.postgra.hydro.ntua.gr/index.php/home-eng/
	Marine and Ocean Technology and Science	http://www.naval.ntua.gr/graduate
	Energy Production and Management	https://www.ntua.gr/en/school/postgraduate-studies
Technical university of Crete School of production Engineering & Management	Technology & Innovation Management	http://www.pem.tuc.gr/index.php?id=7661

[23] https://ec.europa.eu/education/sites/education/files/monitor2016-el_en.pdf

National and Kapodistrian University of Athens School of Science Faculty of Biology	Oceanography **(**Interfaculty Postgraduate Programme **in collaboration with the Faculties of Geology and Geoenvironment, Physics and Chemistry**	http://en.biol.uoa.gr/courses-offered/postgraduate-studies.html
University of Patras Department of Geology	Environmental and Marine Geochemistry	http://www.geology.upatras.gr/index.php/en/
University of Crete Department of Biology	Environmental Biology	http://www.biology.uoc.gr/postgraduate/EnvBiol/index.htm
University of Ioannina Faculty of Biology	Biotechnology	
University of Thessaly **School of Agricultural Sciences**	Sustainable Management of Aquatic Environment	http://pms.diae.uth.gr/
University of Western Macedonia Department of Mechanical Engineering	Energy Technologies and Management	http://mech.uowm.gr/index.php/en/
University of the Aegean School of the environment Department of marine studies	Integrated Coastal management	http://www.mar.aegean.gr/cns/grad/coastal/coastal.php
University of the Aegean School of Business Department of Business Administration	Innovation and entrepreneurship Tourism planning management & policy	http://mba.aegean.gr/ http://tourism-pms.aegean.gr/index.php/en/
University of the Aegean Department of shipping trade & transport	Shipping, Transport and International Trade New technologies in Shipping and Transport	http://www.stt.aegean.gr/en/postgraduate-studies/psp-shipping-trade-and-transport http://www.stt.aegean.gr/en/postgraduate-studies/inter-institutional-msc-new-technologies-in-shipping-and-transport
Western Greece University of Applied Sciences	Sustainable fisheries, aquaculture	http://www.teiwest.gr/index.php/en/studies/postgraduate-studies/msc5

	Renewable Energy Systems (RES)	http://www.teiwest.gr/index.php/en/studies/postgraduate-studies/msc3

In addition, Greek tourism is going strong, marking some 30 million tourist arrivals in 2016, according to tentative figures released by the Greek Tourism Confederation (SETE). The upgrading of the quality of the tourist product is a top priority of the Ministry of Tourism (http://www.mintour.gov.gr). Furthermore, in the modern economic context, it is of particular importance to increase the possibilities of education / training by enriching and broadening knowledge, skills and qualifications, enhancing employment opportunities for tourism workers, and especially for young people. That is why investing in human resources is a prime objective and a priority for the Ministry of Tourism.

Tourism Education

The tourism industry offers an extremely wide variety of professions to choose from, in the sectors of Aviation, Food, Service, Hospitality, Maritime, Tourism Management etc. In Greece, tourism education is provided in all education levels by a multitude of institutions that fall under the public and the private sector. As far as public sector is concerned ten (10) universities of applied sciences (http://www.teiath.gr http://www.teiwest.gr https://www.teithe.gr http://www.teipir.gr http://de.teilar.gr https://www.teicrete.gr http://doeptm.teiste.gr https://ba-g.teiwm.gr https://ba.teiep.gr http://ba.teiion.gr), provides studies of the Tourism and Hospitality Management and cover the field of knowledge of economic and social sciences, specializing on Management of all sections of Tourism Enterprises and Services. The duration of the courses offered is 4 years.

Services of Organization of Tourism Education and Training (OTEK) are provided by the Tourism Ministry, which is responsible for the following training units:

- **two (2) Higher Schools of Tourism education** (in Rhodes and Agios Nikolaos, Crete). The duration of the course offered is 3½ years and provides 210 ECTS points.
- **eight (8) Vocational Training Institutes**, (in Anavyssos Attica, PeraiaThessalonikis, Heraklion Crete, Rhodes, Argos, Corfu, Galaxidi and Alexandroupolis)
- **the Tourist Guide Schools** in Athens, Thessaloniki, Corfu and Heraklion, Crete

http://www.mintour.edu.gr/

In addition, the Ministry, in cooperation with Greek universities, is implementing rapid training programs for the profession of tourist guides (2 months), aiming at graduates of Archeology, History, History of Archeology and Social Anthropology, History of Archeology and Cultural Goods Management and History and Ethnology.

Finally, the Ministry participates as a partner with a co-ordinator of INE-GSEE in the ERASMUS + plus program, "Mobility of trainees and staff of vocational education and training in tourism", which concerns the practice of recent IEK graduates in tourism enterprises of the European Union and is covered by Community resources.

1.5 Italy

a) General context

The Ministry of Education, University and Research (www.miur.gov.it/), monitoring authority of Italian Research Organizations and Universities, is responsible for undergraduate and higher education in Italy. Undergraduate education of relevance for the blue growth is mainly carried out by Technical Institutes, e.g. the 49 Nautical Institutes (http://www.marinamagazine.it/inside.asp?p=335). While Universities and Research centres deliver bachelor and master degrees and PhD courses.

Key training activities in the Blue Growth are also carried out by Regional/local authorities and by technology districts.

Regular on-the-job/job oriented training courses are also carried out by national authorities working at sea, e.g. the Coastal Guard or as implementing authorities of relevant policy strategies, e.g. the Ministry of Environment.

b) Sample of available trainings in the blue growth area

Higher education and other training courses (work-related, vocational, e-learning, etc.)

Universities and research centres

- **University of Trieste and OGS – National Institute of Oceanography and Applied Geophysics** jointly organize the Advanced (postgraduated) Master in Sustainable Blue Growth. The Master aims to train new generation of scientists, technicians and operators, in the marine and maritime sectors, equipped with appropriate skills to bridge the gap between scientific research and sustainable development and support the creation of career opportunities in the blue economy represents an important part of this strategy. The course held in English adopt an interdisciplinary approach covering a number of topics related to blue economy, including **environmental aspects, socio-economic fields and science diplomacy.**
  More on: http://bluegrowth.inogs.it/advanced-master-sustainable-blue-growth.
  OGS is also organizing in Trieste an *Advanced Training School on Sustainable Blue Growth in Mediterranean and Black Sea countries* in collaboration with other partner-institutions and with the aim of developing professional skills and enhance capacities in the marine and maritime sectors and to promote opportunities for blue jobs and growth.

- The Institutes of the **National Research Council of Italy** - CNR collaborates with Universities on PhD Programmes through dedicated agreements. Among the main Institutes involved in the blue growth issues the Institute of Marine Science, the Institute for Coastal and Marine Environment, the Institute of Atmospheric Sciences and Climate, the Marine Technology Research Institute, the Institute of Intelligent Systems for Automation.

Moreover, a multi-disciplinary training programme in Science for diplomacy **"DIPLOMAzia"**, has been launched within a specific agreement between the National Research Council and the Ministry of Foreign Affairs, targeting young graduates and administrators from the North African, Middle Eastern and Balkan Regions that will be trained for 6 months in different discipline. In this framework, in 2014 the course 'Governance and management of fisheries and maritime policies' has been held.

Within **RITMARE national Flagship Project** coordinated by CNR, the Marie Curie BANDIERA-COFUND Programme (supported by the EC FP7-People programme) has been launched in 2013 to offer incoming fellowships to experienced researchers from all over the world in the fields of marine and maritime science (http://www.ritmare.it/en/cofund.html).

- **Stazione Zoologica Anton Dohrn** operates *Ph.D. Programmes* in collaboration with Italian Universities and the Open University (London, UK). More information at: http://www.szn.it/index.php/it/formazione/doctorate-phd-iii-level.

- The **Euro-Mediterranean Center on Climate Change** (CMCC) organizes and manages a programme of summer and winter schools for students of the CMCC Graduate Programs, also open to students from other international Ph.D. programmes on climate change: https://www.cmcc.it/training-programs.

- Universities joining the **National Inter-University *Consortium* for Marine Sciences**, CONISMA (http://www.conisma.it/en/) activate many training courses around blue growth themes. Among these: Specialization School on Underwater Archaeology and Coastal Landscape (University of Sassari); the Second Level Master in Marine Sciences: Ocean Physics and Technology (jointly organized by in collaboration with the Idrographic Institute of the Navy; the Curriculum on Mediterranean Marine Science of the PhD course on Chemical, Geology and Environmental Science by "Bicocca" University of Milan; Master at the University of Camerno.

- The **National Institute of Geophysics and Vulcanology** (INGV), leading the Research Infrastructure Consortium EMSO-ERIC, the European Multidisciplinary Sea-floor and water columns Observatory, has offered training activities, including access to research infrastructures, in the framework of the national project EMSO-MedIT dedicated to the implementation of the infrastructure and in collaboration with other national research centres.

Other examples of relevance for the BLUEMED SRIA challenges, with particular reference to key sectoral enablers, include:

- **University of Venice – Erasmus Mundus Master Course on Maritime Spatial Planning** (EMMCMSP) (http://www.iuav.it/Didattica1/master/master---I1/Erasmus-Mu/index.htm) a two-years advanced professional master program, implemented by a Consortium of three European universities, preparing students to become specialists – providing a multi-disciplinary background – to enable

them to operate both in public institutions as well as independent professionals or researchers as specialists in planning, designing and evaluating projects and policies, which consider terrestrial, coastal and marine dimensions.

- **3rd University of Rome –** Newly born **Master course on Ocean Engineering.** Designed according to the Blue Growth and Sea Economy principle, with particular emphasis on industrial engineering, it is oriented towards marine environment, and technologies for resource exploitation, including energy, and the sustainable development of related infrastructures. Expected impacts are related with the valorization of coastal zone activities in the Lazio Region.
  Note: the course intends also to fill an educational gap, since only four degree are active in Naval Engineering in Italy, a bachelor course on Nautical Engineering and a Master Course on Offshore Engineering.

Technology districts

Districts are key for developing at local level networks between universities, research institutions and companies, while also encouraging operators of the private sector to invest more in training and knowledge transfer. Resources to implement these activities rely often on competitive EU structural funds. The table below lists relevant examples.

Name, legal status and website and sector	**Examples of training activities**
Name: Distretto Ligure delle Tecnologie Marine (DLTM) **Status:** Technology Cluster – Consortium **Website**: www.dltm.it	ISTM - International School on Maritime Technologies targeting undergraduate and graduate students, enterprises. More details at: http://dltm.it/scuola-internazionale/azioni-e-target/
Name: NAVIGO scarl **Status:** Limited Liability Consortium **Website**: www.navigotoscana.it	Innovative training courses in two macroareas: - entry the yachting district; - specialized skill for companies. More details at: http://www.navigotoscana.it/servizi-formazione/
Name: MARE FVG **Status**: Maritime Technology Cluster	Education and dissemination of entrepreneurial and maritime culture through start-up of PhD courses, orientation; support in

Website: www.marefvg.it/en/home.htm	realizing high skilled and technical educational paths for industry. Advanced Master (AM) Maritime Security. It is part of the "Advanced Skills in Safety, Environment and Security at Sea-ASSESS" project, approved and co-funded in the framework of the Call Blue Careers in Europe and launched by DG Mare. The project aims to realize three specific education and training paths, in English language, for human resources, both employed and young people, that will be able to manage safety and security issues in the maritime sector. The partnership, made up from mareFVG, University of Trieste, Lloyd's Register EMEA, National Institute of Oceanography and Applied Geophysics (OGS) and National Research Council (CNR INSEAN), with the collaboration of Fincantieri and Wärtsilä, strives for the courses to become an international reference on these topics that are becoming more and more relevant for the maritime sector in Europe as well as in the world. More details at: http://www.assess-project.com/course/advanced-master/ http://www.ilfriuli.it/articolo/Tendenze/Primo_Master_in_sicurezza_marittima_a_Trieste/13/175419
Name: COSVAP - Fisheries and Blue Growth District **Status:** Non-governmental organization **Website**: www.distrettopesca.it/	- Training activity project among youth from Africa and the Mediterranean (Medimondo Project) - Training activity of sea operators (Club Bleu Artisanal Project) - Seminars on Blue Growth principles to structure a Blue Economy Zone, workshops on fisheries jobs and ecological, social and economic sustainability - Training programs are realized in collaboration with CNR-IAMC of Mazara del Vallo and Stazione Zoologica Anton Dohrn, i.e. the Advanced Training Course "Biology and Ecology of Fisheries" and "Hygiene and Control of Fisheries and Aquaculture Products", which involve researchers, students, professionals in research and technical training.

Ministry of Environment

In the framework of the Marine Strategy Framework Directive (MSFD), the Italian **Ministry of Environment** through the **Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA)** activated 15 training *e-learning* courses for technical personnel of the Regional Agencies for Environmental Protection working on monitoring activities as well as for Central Administrations and local authorities dealing with sea

affairs. Topics include legal aspects, data processing, monitoring, marine habitats and identification of marine organisms.

c) A case study: the mapping of the offer on sea-related training courses by University of Bologna

As best practice to collect the information about training offer on blue growth at University level, the scheme reported below designed by Bologna University for 'turning complexity into order' can be followed.

For instance, considering that the number of interrelations of factors and aspects involved in the general definition of "sea" is too complex to be easily subdivided into neat sections, some common patterns and issues can be discerned. University of Bologna identify 12 main areas named 'themes', embracing all possible aspects, from humanities to pollution, from climate change to biotechnological exploitation of marine resources.

1. Marine ecosystems, including vulnerabilities and resilience to anthropic impacts
2. Climate change, adaptation and mitigation plans
3. Risks and coastal protection (including erosion, pollution, marine litter and spills)
4. Blue & White Biotech for marine environment
5. Fisheries
6. Aquaculture
7. Tourism
8. Marine spatial planning and integrated coastal zone management
9. Maritime transport technologies and infrastructures
10. Observation and oceanographic systems
11. Multi-purposes offshore marine platforms
12. Marine coastal cultural heritage

According to these themes, three lists have been drafted. The first on academic programs including on sea-related topics, the second on professional masters, winter and summer schools and the continuing education courses offered that include sea-related issues, the third lists specific courses on sea-related issues offered within academic programs. Some titles are reported in Italian.

Academic Programs offered at University of Bologna including Sea-related Topics

Theme Reference			Program name	Program Type
9	10		Advanced Design	Second cycle degree - two years master
1			Biologia Marina	Second cycle degree - two years master
8			Chemical and Process Engineering – STEM international curriculum - off-shore engineering option	Second cycle degree - two years master

Theme Reference	Program name	Program Type

11	9		Civil Engineering - Curriculum Offshore Engineering	Second cycle degree - two years master
12			Cooperazione internazionale, tutela dei diritti umani e dei beni etno-culturali	Second cycle degree - two years master
9	10		Disegno Assistito dal Calcolatore M	Second cycle degree - two years master
1	2		Doctoral Programme on Marine Ecosystem Health and Conservation (MARES)	Ph.D. Erasmus Mundus
7	12		Tourism Economy	Second cycle degree – three years
9	11		Environmental Engineering – ERE international curriculum - off-shore engineering option	Second cycle degree - two years master
12	7		Global and International Studies	Ph.D.
7	12		International Tourism and Leisure Industries	Second cycle degree – three years
8	10		MACOMA (Marine and Coastal Management)	Ph.D. Erasmus Mundus
1	2	8	MARES Doctoral Programme in Marine Ecosystem Health and Conservation" (EU- 512002-1-2010-1- BE-EMJD)	Ph.D.
12	7		MIREES (Master's in Interdisciplinary Research and Studiers on Eastern Europe)	Second cycle degree - two years master
12			Science for the conservation-restoration of cultural heritage	Second cycle degree - two years master
1			Scienze della Terra, della Vita e dell'Ambiente	Ph.D.
6	5		Sicurezza e qualità delle produzioni animali	Second cycle degree – three years
7	12		Tourism Economics and Management	Second cycle degree - two years master
8	3		WACOMA (Water and Coastal Management)	Second cycle degree - two years master Erasmus Mundus
12			Cooperazione internazionale, tutela dei diritti umani e dei beni etno-culturali	Second cycle degree - two years master
12			International Cooperation on Human Rights and Intercultural Heritage	Second cycle degree - two years master

Professional Masters, Winter/Summer Schools and Continuing Education Courses offered at University of Bologna on Sea-related Topics

Theme Reference			Program name	Program Type
6	5		Acquacoltura e Ittiopatologia	First level professional master

Theme Reference			Program name	Program Type
5	6		Course on sea bream hatchery technology	Continuing Education
12	7		European Region Master in Democracy and Human Rights in South East Europe	Professional Master
2	12		Human Rights, Migrations, Development	Professional Master
2			Inclusion Promotion of Migrants through the Human Rights Based Approach in the Field of Services of Local Administration	Continuing Education
9	11		Introduction to Off-Shore and Marine Systems Engineering	Winter School
9	10		ISYE (International School of Yacht Engineering)	Summer/Winter School

Theme Reference			Program name	Program Type
2			Migrations, Development and Human Rights between Human sciences and Natural sciences in the Field of the European Project Amitié Code – Capitalizing on Development.	Continuing Education
5	6		Pesca e acquacoltura sostenibile	Continuing Education
7	12		Tourism capacity building in Myanmar	Continuing Education
7	12		Valorizzazione turistica dei beni e degli eventi culturali	Professional Master
11	9	4	Winter school in offshore and Marine systems Engineering	Summer/Winter School

Specific Courses on Sea Topics offered within academic programs

Theme Reference			Course name	Program
6	5		Acquacoltura e Igiene delle Produzioni Ittiche	
1	2	8	Adattamenti degli animali all'ambiente marino	Marine Biology
1	2	8	Alterazione e conservazione degli habitat marini	Marine Biology
1	3		Applied Marine Botany	Marine Biology
1	2	8	Biologia delle risorse alieutiche	Marine Biology
5	6		Chimica Strutturale Sistemi Biologici	
2			Climatologia	
11	9	3	Coastal Engineering	Civil Engineering
8	3	2	Dinamica dei litorali e rischi costieri	
1	2	8	Diritto dell'ambiente marino e della pesca	Marine Biology
1	2	8	Disciplina giuridica delle aree marine protette	Marine Biology
1	3		Disegni sperimentali e Analisi dati	Marine Biology
1	2	8	Ecologia microbica marina	Marine Biology
6			Economia e Politica della Pesca	Fishery economics and policy
1	2	8	Economia e politica della pesca	Marine Biology
1	2	9	Ecosistemi marini - struttura e processi	Biologia Marina
10			Fisica del Sistema Terra	
1	2	8	Fondamenti di scienze marine	Marine Biology
1	8		Fondamenti di Scienze Marine (Modulo oceanografia geologica)	
1	2	8	Hot topics in marine sciences	Marine Biology

8			Idraulica	
8	3	2	Idraulica Marittima	
1			Idrologia Ambientale	
1	2		Laboratorio di subacquea scientifica: tecniche di immersione per il rilevamento biologico	
1			Laboratorio sperimentale in mare	Marine Biology
8	4		Marine Plant Biotechnology and Algal Toxins	Marine Biology
6	5		Marketing dei prodotti agroalimentari	
1	2	8	Microbiologia marina e cicli biogeochimici	Marine Biology
1	2		Modelli di accrescimento e dinamica di popolazione	
11	9		Ocean Engineering	Civil Engineering
1	2	8	Oceanografia chimica	Marine Biology
10			Oceanografia Costiera	
10			Oceanografia Fisica	
1	2	8	Pianificazione e gestione dello sviluppo costiero	Marine Biology

Theme Reference			Course name	Program	Language	Location
1	2	8	Ricerca Scientifica Subacquea	Marine Biology	Italian	Ravenna
1	2	8	Sedimentologia degli ambienti marini	Marine Biology	Italian	Ravenna
1	2	8	Struttura e connettivita' delle popolazioni marine	Marine Biology	Italian	Ravenna
10			Struttura e dinamica oceano/atmosfera		Italian	Ravenna
1	2	8	Valutazione e gestione ecocompatibile delle risorse alieutiche	Marine Biology	Italian	Ravenna

d) General comment

Training scenario in the blue economy is not-homogenous and fast evolving; it is implemented by different stakeholders at different scale (regional, national, transnational), and often lasts according to EU/national programming timeframe. In the last few years, many opportunities specifically dedicated to the Blue Economy have arisen, including technical and on the jobs training courses.

Recognizing the difficulty of developing a comprehensive and up-to-date database including higher education activities and tailored technical courses, the possibility to list and access macro sources of information per thematic area (e.g. through key words) can help identifying needs and gaps. As an example, many observatories of key economic sectors usually assess training offers. However, usually monitoring it is not designed to extract relevant information for activities specifically dedicated to the blue economy, such as in the case of the Italian Tourism National Observatory set up by the Touring Club Italia Association.

Anyway, the need of a mapping exercise has been pointed out also during the kick-off meeting of the experts group on blue skills and career development in the Blue Economy, set-up by DG-MARE in 2017 (https://webgate.ec.europa.eu/maritimeforum/en/node/4082).

A systemic study on the offers available at national level supported by quantitative analysis can indeed help defining tailored solutions (see the case study above), both at higher education level and to activate courses for improving technical skills. For instance, according to the "Fifth report on Sea Economy 2016" by Unioncamere, http://www.unioncamere.gov.it/P55A3097C2507S144/-rapporto-unioncamere-sull-

economia-del-mare-2016.htm, in Italy a high percentage of unskilled workforce is employed in the tourism and fishing industry, while higher qualified personnel works in the sectors of mining and shipbuilding. This information can trigger decision making process if complementary or specialized training activities can better skill the workforce to face the present needs of blue economy.

The National Cluster on Blue Growth that is joined by many different stakeholders could promote and facilitate the collection of relevant information for the mutual benefit of training providers and users.

1.6 Malta

In Malta accreditation of further and higher education institutions is supervised and accredited by National Commission for Further and Higher Education (NCFHE). It maintains a register of accredited further and higher educational in Malta.

There are three institutions in total in Malta that by virtue of Chapter 327 – Education Act, are considered as public self-accrediting institutions:

Table 1.6: Malta Public Educational institutes

Title	Area of specialisation, courses offered
University of Malta	Arts; Built Environment; Dental Surgery; Economics, Management & Accountancy; Education; Engineering; Health Sciences; Information & Communication Technology; Laws; Media & Knowledge Sciences; Medicine & Surgery; Science; Social Wellbeing and Theology
Malta Collage of Arts, Sciences and Technology	Business administration, Applied Sciences, Business Management and Commerce, Community Services, Creative Arts, Engineering and Transport, Information and Communication Technology, - Centre for Maritime Studies
Institute of Tourism Studies	Hospitality and Tourism Management, Hotel Operations, Accommodation Operations, Travel Agency Operations, Travel and Tourism, Tour Guiding

All of them have strong orientation toward **Blue Growth capacity building**. A number of programs offered at UoM, MCAST and ITS are relevant to the Blue Growth matters. Although in the past years efforts were made to de-centralize higher education, higher education in Malta is still highly dominated by University of Malta (UoM), the largest higher education institution in the Malta.

In Malta the Ministry for Education is also responsible for human resource development. The overall mission of the Ministry of Education and Human Recourses is to oversee and plan an ongoing process of reforms and development of the Maltese education system, aimed ultimately at seeking to prepare students for life, including their working life (from the book "Secondary education in Malta", author - Paul A. Attard).

Table 1.7: Malta's private Universities

Title	Area of specialisation, courses offered
Middlesex University (Malta)	Business information, ICT
European Graduate School	Philosophy, Art, and Social Thought (PAS), and Literary, Musical, and Visual Thought (LMVT).

Barts and The London School of Medicine and Dentistry	Medicine & Dentistry
American University of Malta	Accounting, Business Administration, Game Development

The most of the private institutions are business or theology oriented, so that not listed here. Below is the overview of most important sectors in Malta that are currently important and have further potential for blue growth and some of the high education programs related to them.

According to EUNETMAR Country, fiche for Malta produced in year 2014 (https://webgate.ec.europa.eu/maritimeforum/sites/maritimeforum/files/Malta_cf.pdf most relevant and promising marine and maritime activities in Malta are: coastal tourism, cruise tourism, passenger ferry services, short-sea shipping (incl. Ro-Ro), yachting and marinas, and marine aquaculture. The following largest maritime activities have been ranked according to their combined GVA and employment levels: Coastal tourism, Passenger ferry services, Shipbuilding and ship repair, Traceability and security of good supply chains, Securing fresh water supply (desalination), Short-sea shipping (incl. Ro-Ro) and Fishing for human consumption. According to the same document there is a good standard for schooling for all of these activities and for most of them barriers to growth that are related to education have not been identified. In case of aquaculture, a limited specialized training in aquaculture was identified as a barrier. Limited labour pool, esp. in peak months was identified as a barrier to growth for Coastal Tourism.

Malta has a strong tourism orientation, with EUR 1,278.5 mn direct contribution from Travel & Tourism to Malta's GDP, which corresponds to 14.1% of total GDP in 2016 and a rise by 6.5% is the forecast for 2017. Total Contribution from Travel & Tourism to Malta's GDP was EUR2, 425.5mn, 26.7% in 2016.

According to Malta's National Tourism Policy 2015- 2020 (http://mhra.org.mt/wp-content/uploads/2015/08/TOURISM-POLICY-2015-2020.pdf) tourism is the main contributor of Maltese market services sector and it is expected to increase. To secure this growth, as well as make it sustainable, country needs to rely on its capacity building abilities.

The Institute of Tourism Studies (ITS) in Malta is offering the study programs that are directly related to tourism (e.g. Tourism, Tourism management, Tourism marketing, Hospitality Management, etc.). Maltese government is investing in the tourism work force. The Institute of Tourism Studies (ITS) is building a new ITS building at Smart City, costing about €70 million. This is the largest amount ever spent on human capital in Malta in relation to the tourism industry. Besides these, there are numerous study programs in economics, different natural sciences, energy and transportation engineering, computer sciences, visuals arts, medicine, dental medicine, languages, history of art, and other disciplines that are crucial support for tourism industry.

The growth and expansion of tourism in the Maltese Islands needs to sustain parallel development in the employment field if Malta's overall competitiveness is to be sustained. This development should not only be constrained in aspects such as employment generation and rates of remuneration but also extend to areas such as career development, entry qualifications and continuous personal development while on the

job. Only in such a way can the link between a job in tourism and the provision of excellence in hospitality be achieved. The role of the various educational establishments including the Institute for Tourism Studies, the University of Malta and the Malta College for Art, Science and Technology in assisting the realization of these objectives is of paramount importance.

There are a number of market segments, which have the potential to add to and diversify Malta's tourism inflows through the medium of maritime connectivity. The potential of these segments is further enhanced by the winning combination of Malta's location and excellent harbour and ship servicing facilities.

Ship servicing, ship repair and **sea traffic** have long term tradition in Malta. The MCAST Maritime Institute is the only institution in Malta entrusted & accredited with the education & training of seafarers in Nautical Studies, Marine Engineering, Electronic and Information Technologies, etc. Furthermore, this institution is offering the short courses in maritime training, seafarers education and training.

Malta Sailing Academy is offering STCW 95 courses and training for all certificates required for international navigation. Additionally, Manoel Island Marina is offering the infrastructure for practical training.

Fisheries and aquaculture sector is also very important in Malta. Although its contribution in country's GDP is <1%, it is important segment due to export, employment in coastal areas, support to tourism industry and overall local economy. There is no higher education programs related to fisheries and aquaculture in Malta.

Aquaculture was ranked top (1st) as the activities with most future potential. Aquaculture industry in Malta is growing fast, but spatial restrictions suggest that combining intensive aquaculture with high value marine biological products is an optimal compromise.

The Aquaculture Directorate has been recently established from the Malta Aquaculture Research Centre in order to extend the remit of the Centre by assigning regulatory functions to it. The Directorate is responsible for the implementation of the Aquaculture Strategy for the Maltese Islands 2014 - 2025 which provides a holistic vision for the Aquaculture Sector in Malta.

Maritime monitoring and surveillance in Malta is playing an essential role as strategic barrier against immigration from Africa. Without security, marine growth in Malta is vulnerable to external factors. Unfortunately, Malta does not have major incremental employment potential, although there is a strong IT industry and the companies could specialize in surveillance platforms. The following Master programs are offered by University of Malta in collaboration with other Institutions: Master in Conflict Resolution and Mediterranean Security and Master in Ocean Governance.

Overall, high education programs offered in Malta **provide baseline for BLUE GROWTH issues**. Considering the size of the country, the number of programs offered and number of institutions, both private and public, is quite impressive. There are certain concerns that there is lack of synergies and cooperation between institutions. Sustainable BLUE GROWTH requires interdisciplinary approach, and majority of study programs offered are not interdisciplinary.

A significant contribution has been given to **the Bologna Process in Malta** by the setting up, in June 2007, of the Malta Qualifications Framework for Lifelong Learning. The vast

majority of the EHEA countries including Malta use ECTS for all their higher education programmes. However, the extent to which ECTS credits are linked with learning outcomes in higher education programmes is still not universal and Malta is one of the 19 EHEA countries that still need to achieve further progress in this respect.

According to the SkillsAgendaFactsheets, in Malta the skills and education statistics for 2016 is as follows:

Educational attainments of adults:

- 13% of students in Vocational Education and Training VET
- 27% of adults (30-34) with higher education / 38,5% in the EU
- 7% of adults in lifelong learning / 11% in the EU

53,5% of employers who encounter difficulties in finding employees with the right skills / 40% in the EU

54% of companies financing training to their employees / 66% in the EU

69,7%: employment rate in % of low skilled young people / 53,1 in the EU

96,2%: employment rate in % of high skilled young people / 80,5% in the EU

1.7 Portugal

a) Introduction and national context

Portugal has one of the most ancient university in Europe: the University of Coimbra was created in 1290 and is still in service. To access higher education in Portugal, future students have to pass a mandatory exam. The results of this exam and the grades obtained in high school are conditioning access to selective trainings and universities[24]. In 2013, 371,000 students were enrolled in a higher education training. 67.9% of high school graduates pursue their education in a higher education organization; they were 7.7% more in 2008. 81% of the students are enrolled in a public institution and 18.13% in private institution[25]. In 2016, 46% of students are in vocational educational training[26]. Portugal has 14 public and 17 private universities; 1 catholic university; and Polytechnical Institutes that offer specialized trainings in engineering, agriculture, management or education. Some trainings are related to environment, like the programme „Analysis and control of environmental health risks" and „Quality and environmental engineering" offered at the Higher Institute of engineering of Lisabon.

http://www.isel.pt/en/courses/master-degree/analysis-and-control-of-environmental-health-risks

http://www.isel.pt/en/courses/master-degree/quality-and-environmental-engineering

In 2016, 31.3% of adults (30-34) have a higher education qualification (38.5% in the EU) and 10% of adults are enrolled in lifelong learning (11% in the EU)[27]. The number of students enrolled at PhD level had a 175% increase between 2000-2001 and 2009-2010[28]. Portuguese students are choosing mostly 2 domains of trainings: social sciences/business/law (31.2%) and engineering/processing industries/building (22.2%)[29].

16 888 foreign students studied in Portugal in 2015, including 11 459 students studying abroad in the framework of the programme Erasmus +. In 2014-2015, 8034 Portuguese students studied abroad in the framework of this programme. Portugal's strategy within H2020 is to **value local resources** and to **develop tourism**.

In 2014, 1.3% of Portugal's GDP was allocated to scientific research[30]. Concerning sea related strategic development, Portugal has one public institution, placed under the authority of the Ministry of the Sea: the Portuguese Institute of Sea and Atmosphere (Instituto Português do Mar e da Atmosfera, IPMA).

http://www.ipma.pt/pt/index.html

http://www.portugal.gov.pt/pt/ministerios/mm.aspx

[24] http://ressources.campusfrance.org/publi_institu/agence_cf/focus/fr/focus_portugal_fr.pdf
[25] http://www.diplomatie.gouv.fr/IMG/pdf/PORTUGAL_fiche_Curie_19_novembre_2014__cle886a78.pdf
[26] http://ec.europa.eu/social/keyDocuments.jsp?langId=en&mode=advancedSubmit&advSearchKey=SkillsAgendaFactsheets
[27] http://ec.europa.eu/social/keyDocuments.jsp?langId=en&mode=advancedSubmit&advSearchKey=SkillsAgendaFactsheets
[28] http://www.diplomatie.gouv.fr/IMG/pdf/PORTUGAL_fiche_Curie_19_novembre_2014__cle886a78.pdf
[29] http://www.diplomatie.gouv.fr/IMG/pdf/PORTUGAL_fiche_Curie_19_novembre_2014__cle886a78.pdf
[30] http://ressources.campusfrance.org/publi_institu/agence_cf/focus/fr/focus_portugal_fr.pdf

In 2017, 23.8% of the youth population and 8.8% of the total population is unemployed[31]. In 2016, 71.4% of low skilled young people (53.1 in the EU) and 73.6% of high skilled young people (80.5% in the EU) have a job[32]. In 2016, 38.7% of Portuguese employers say they encounter difficulties in finding employees with the right skills (40% in the EU) and 65% of companies are financing training to their employees (66% in the EU)[33].

b) Sample of available trainings in the blue growth area

Being a former major maritime power, Portugal has various educational programmes related to marine and maritime sciences. For example, the Interdisciplinary Centre for Marine and Environmental Research (CIIMAR) of the University of Porto both offers trainings and conducts research related to oceans, seas and environment.
http://www.ciimar.up.pt/

Research is conducted in the following domains:

- **Global changes and ecosystems services**: to develop knowledge about ecosystems and ocean dynamics and develop sustainable exploitation of sea resources, together with SMEs and local authorities. Research is conducted in various disciplines, including some related to blue growth like global climate change issues, unravelling marine biodiversity, ecosystem function and management, environmental risk assessment, sustainable exploitation of fisheries, human impact in coastal, open and deep sea ecosystems;
- **Aquaculture and seafood quality**: to develop knowledge and innovation, through basic and applied research related to aquaculture and seafood industry, together with the industry sector. Research is conducted in various disciplines, including some related to blue growth like sustainable development of aquaculture, innovative diets based on sustainable resources to provide optimal nutrient composition, immunological conditions, disease resistance and control, quality and reduction of environmental pollution, alternative aquaculture systems, quality and safety of seafood products;
- **Marine biotechnology**: to develop innovative techniques and products that have societal and economic impacts. Research is conducted in various disciplines, including some related to blue growth like emergent HAB shellfish toxins and development of biosensors, emergent microbiological or biochemical-based technologies to improve seafood quality and the value-added utilization of fishery and aquaculture products, biotechnological tools for ecosystems recovery, bioremediation and phytoremediation processes.

CIIMAR also offers trainings at Master and PhD levels in Marine and Environmental Sciences. Masters offers are the following:

- MSc in Marine Sciences - Marine Resources

http://sigarra.up.pt/icbas/en/cur_geral.cur_view?pv_curso_id=1301&pv_ano_lectivo=2017&pv_origem=CUR

- MSc in Toxicology and Environmental Contamination

[31] http://tradingeconomics.com/portugal/youth-unemployment-rate
[32] http://ec.europa.eu/social/keyDocuments.jsp?langId=en&mode=advancedSubmit&advSearchKey=SkillsAgendaFactsheets
[33] http://ec.europa.eu/social/keyDocuments.jsp?langId=en&mode=advancedSubmit&advSearchKey=SkillsAgendaFactsheets

http://sigarra.up.pt/icbas/en/cur_geral.cur_view?pv_curso_id=1291&pv_ano_lectivo=2017&pv_origem=CUR

- Master in Biological Aquatic Resources

http://sigarra.up.pt/fcup/en/cur_geral.cur_view?pv_curso_id=959&pv_ano_lectivo=2017&pv_origem=CUR

CIIMAR is part of the Doctoral School in Marine and Environment Sciences, together with the University of Porto, through ICBAS (Instituto de Ciências Biomédicas Abel Salazar) and the Faculty of Sciences, the University of Aveiro, and the CESAM (Centre for Environmental and Marine Studies).

CIIMAR is also member of the Doctoral Programme on Marine Ecosystem Health and Conservation, a joint programme with 24 partners from 14 countries, including Italy, Spain, France and Greece, funded in the framework of Erasmus Mundus. Nine fellowships for 3 years are offered during this 5-year programme. Beneficiaries have to conduct research in the field of marine sciences in at least 2 partner institutions. Other Portuguese institutions members of this programme are the University of Algarve, the University of Aveiro, and the Portuguese Association of Trawlers (ADAPI).
http://www.mares-eu.org/

Other universities are offering trainings related to environmental and sea sciences. Here are some examples:

Bachelors:

Bachelor *in Environmental engineering*
School of Agriculture, University of Lisbon
Vacancies for international students: 5
http://fenix.isa.ulisboa.pt/qubEdu/cursos/leamb?locale=en_EN_qubExtensions

Bachelor *in Naval architecture and marine engineering*
Higher Technical Institute, University of Lisbon
Vacancies for international students: 6
http://fenix.tecnico.ulisboa.pt/cursos/lean

Bachelor *in Meteorology, oceanography and geophysics*
Faculty of Sciences, University of Lisbon
Vacancies for international students: 5
http://fenix.ciencias.ulisboa.pt/degrees/meteorologia-oceanografia-e-geofisica-564500436615386

Bachelor *in Spatial planning and management*
Institute of Geography and Spatial Planning, *University of Lisbon*
Vacancies for international students: 2
http://www.igot.ulisboa.pt/ensino/licenciatura-em-planeamento-e-gestao-do-territorio/

Masters:

Master in Energy and Environmental Engineering
Faculty of Sciences, University of Lisbon
Vacancies for international students: 5
http://fenix.ciencias.ulisboa.pt/degrees/engenharia-da-energia-e-do-ambiente-564500436615280

Master in Environmental Engineering
Higher Technical Institute of Lisbon
Vacancies for international students: 7

http://fenix.tecnico.ulisboa.pt/cursos/meambi?locale=pt

Master in Environmental sciences and technologies
Faculty of Sciences, University of Porto
http://sigarra.up.pt/fcup/en/cur_geral.cur_view?pv_ano_lectivo=2017&pv_origem=CUR&pv_tipo_cur_sigla=M&pv_curso_id=866

Master in Ecology and environment
Faculty of Sciences, University of Porto
http://sigarra.up.pt/fcup/en/cur_geral.cur_view?pv_ano_lectivo=2017&pv_origem=CUR&pv_tipo_cur_sigla=M&pv_curso_id=10821

Master in Biological aquatic resources
Faculty of Sciences, University of Porto
http://sigarra.up.pt/fcup/en/cur_geral.cur_view?pv_ano_lectivo=2017&pv_origem=CUR&pv_tipo_cur_sigla=M&pv_curso_id=959

Master in Environmental contamination and toxicology
Faculty of Sciences, University of Porto
http://sigarra.up.pt/fcup/en/cur_geral.cur_view?pv_ano_lectivo=2017&pv_origem=CUR&pv_tipo_cur_sigla=M&pv_curso_id=1304

PhD in Marine biotechnology and aquaculture
Faculty of Sciences, University of Porto
http://sigarra.up.pt/fcup/en/CUR_GERAL.CUR_VIEW?pv_ano_lectivo=2017&pv_curso_id=10841&pv_origem=CUR&pv_tipo_cur_sigla=D

Master in Ecology
Department of Life sciences, University of Coimbra
http://apps.uc.pt/courses/EN/course/354

Master in Cellular and molecular biology
Department of Life sciences, University of Coimbra
http://apps.uc.pt/courses/EN/course/331

c) Case study: the International Master in Applied Ecology (IMAE)

Portugal is member of various European and international educational projects and exchanges. For example, the International Master in Applied Ecology (IMAE) was created in the framework of the Erasmus + programme. Members of the consortium are the University of Coimbra (Portugal), the University of Poitiers (France), the University of East Anglia (UK), the Christian-Albrechts University (Germany), the Federal University do Rio Grande do Sul (Brazil), the University San Francisco de Quito (Equator), the University of Otago (New Zealand), the University of Adelaide (Australia), the University of Georgia (US).

This interdisciplinary and international training aims to teach students conceptual as well as practical skills. The "*adaptable and innovative graduates will be capable of devising original and new solutions to meet the challenges of evolving problems in applied ecology and to carry out a variety of environmental projects all over the world*."[34]

[34] http://www.emmc-imae.org/aims-of-the-programme/

The students will be able to develop their skills in various domains: ecological diagnoses about human-related or natural disturbances; dynamics and functions in both temperate & tropical ecosystems (continental and aquatic); consequences of global change on the equilibrium of ecosystems; biodiversity assessment, conservation and management; ecosystem services: a price on biodiversity and natural resources; trade-off between human activities and conservation biology; environmental policies and economics in the management of natural resources.

Students are studying in all or some of the universities members of the consortium: http://www.emmc-imae.org/overview-study-programme/. Students can choose to study various languages (French, German…) but they all have to be fluent in English, as most of the courses are taught in English. Graduates from ecology, biology, environmental sciences and other related fields can apply to this Master. Applicants who already started their professional career may get an academic equivalency based on the professional experience of the applicants (validation of acquired experience).
http://www.emmc-imae.org/

1.8 Slovenia

The Ministry of Education, Science and Sport is responsible for education on the national level. It formulates and implements education policies, as well as makes system regulations, directly or indirectly. The same ministry outlines national programs and draws up budgets for all levels of education. Higher Education Directorate supports the Ministry when higher education is concerned.

Universities and independent higher education institutions are, on the other hand, autonomous institutions. This is declared in the Constitution of the Republic of Slovenia and specified by the Higher Education Act. In addition to the freedom of research, artistic creation and transmission of knowledge, the universities have the right to self-govern their internal organisation and practices of relevant bodies.

The tertiary education in Slovenia consists of short-cycle higher vocational education and higher education. In 2016/2017 school year, 28 public and 20 private higher vocational colleges advertised open places in year one of 31 various study programs. Higher education is organized at public and private universities and independent higher education institutions. In the 2016/2017 academic year, over 68 500 students pursued studies at faculties, art academies and higher education professional institutions.

Higher education is organized in three study cycles (the Bologna study). The first-cycle features professional and academic undergraduate study programs; the second-cycle features postgraduate master's study programs (second cycle or integrated), and the third-cycle postgraduate doctoral study programs.

There are three public universities in Slovenia; University of Ljubljana (http://www.uni-lj.si), University of Maribor (http://www.um.si/), University of Primorska (http://www.upr.si); and three private ones; University of Nova Gorica (http://www.p-ng.si) and EMUNI University (http://www.emuni.si) and the "Nova Univerza" University. Beside these 5 Universities there is one public and 26 Independent higher education institutions, but the majority of them is located in the inland.

According to same source there is total of 995 University programs currently accredited in the Republic of Slovenia. Out of these 443 are professional and academic undergraduate study programs, 442 are postgraduate master's study programs, and 110 are postgraduate doctoral programs. All of them developed as a part of Bologna Process. Due to large number of high education programs, it is very difficult to assess them in relation to Blue Growth. (data source Slovenian Quality Assurance Agency for Higher Education. http://www.nakvis.si/sl-SI/Content/Details/46).

Table 1.8: Public and private Universities in Slovenia with indicated number of accredited study programs and a total number of teachers. Data from annual reports of the respective Universities and the Slovenian Quality Assurance Agency for Higher Education – (http://www.nakvis.si/sl-SI/Content/Details/46).

Institution	Location	N of accredited study programs	N of employed teachers (2016)
University of Ljubljana	Ljubljana	461	2681
University of Maribor	Maribor	218	1005
University of Primorska	Koper	111	479
University of Nova Gorica	Nova Gorica	24	146
EMUNI University	Portorož	4	
Nova Univerza	Nova Gorica	14	
Independent higher education institutions	In various locations in Slovenia	163	

The 2014 EUNETMAR Country fiche for Slovenia listed the most relevant and promising marine and maritime activities in Slovenia. These are coastal tourism, water projects, fishing for human consumption, short-sea shipping (incl. Ro-Ro), deep-sea shipping, shipbuilding and ship repair and cruise tourism. In terms of education; according to the same document; the growth of blue biotechnology has little to relay on. There indeed is an adequate workforce in terms of dimension and qualification for such an early stage of development, but on the other hand, there is no dedicated university training. The sector will need to employ workforce from abroad in case of expansion. Universities abroad have a longer standing tradition in the field. Short-sea and deep-sea shipping seem to be favored by the fact that adequate training policies are already in place. The University of Ljubljana offers specialized courses. However, the education level still not on par with EU's best practices. For the kind of cruise tourism that Slovenia already offers, at the moment there is no need for particularly high education standards. There are universities with specialized courses (even post-graduate) in tourism and coastal tourism. While the rest of the coastal tourism does not benefit of the fact that the minimum wage system in force in Slovenia. Low wages for employees in the tourism sector is not stimulating. This is a bad motivation for qualified people to work in it.

Tourism

In the second half of the last century, the tourism sector saw a remarkable growth in Slovenia. Tourism (direct) gross domestic product (GDP) amounted to EUR 1,824 million

in 2014 (http://www.stat.si/StatWeb/en/News/Index/5678) and represented 4.9% of the total GDP in Slovenia In Coastal Karst, this led to a concentration of tourism and related employment opportunities and economic development in the narrow coastal belt and in the summer months. The Coastal Karst area together represent approximately ¼ of the tourist visits in the last decade. This process encouraged emigration from inner Slovenia to coastal towns. This explains why coastal tourism has become the largest maritime economic activity in Slovenia. The port of Koper is the only port in Slovenia that has become a regular cruise destination since 2005. Even so cruise tourism has still small size and is strongly dependent on other destinations such as Venice or Dubrovnik. The excellent performance of the port of Koper so far is only a bonus to the developing activity. To underpin this growth and make it sustainable, Slovenia needs to rely on different professional programs. Currently several institutions have study programs that are directly related to tourism (e.g. Tourism, Tourism management, Tourism marketing, etc.) and they are located on the coast as well as inland. Public high education institutions with programs related to tourism include Faculty of Tourism Studies–Turistica (Portorož), and Faculty of Management (Koper), University of Primorska, Faculty of Tourism (Brežice) and the Faculty of Economics and Business (Maribor), University of Maribor, Faculty of Economics (Ljubljana), University of Ljubljana and at the private GeaCollege (Ljubljana).

Short sea-shipping and deep-sea shipping:

The two activities in the time series of interest should be analysed as one, because no clear differences can be outlined in Slovenia as to the reasons behind this success. Both activities are very important in the port of Koper. The dramatic increase in terms of GVA (+26.31% for short-sea shipping and +16,39% for deep-sea shipping over the three-year time series). Their increasing size and plans for doubling the activity is connected with the excellent position of Koper in the North Adriatic. The necessary knowledge that a tertiary education system can offer, is carried out at the Faculty of maritime Studies and Transport (Portorož) and faculty of Mechanical Engineering (Ljubljana) that are a part of the University of Ljubljana, Faculty of Logistics (Celje) University of Maribor. A solid tradition has helped to keep the sector alive and of a certain size. At present however, there is only one shipyard left in Slovenia. Despite a solid tradition the shipyard is currently mostly refitting rather than shipbuilding.

Protection of habitats

This not being an economic activity per se, the positive trend simply reflects an increase in the level of public expenditure for the protection of habitats. Nonetheless, this increase indicates that there is better awareness of environmental protection and sustainable development in Slovenia because of the EU accession, as well as the Barcelona Convention whose contracting parties adopted the Regional Working Programme for the Coastal and Marine Protected Areas in the Mediterranean Sea including the High Seas. In spite of its shortness, the Slovenian coastal area is very rich in terms of biological and landscape diversity. Its natural characteristics comprise a great diversity of habitat types, animal and plant species and ecosystems scattered between the rocky shore and its flysch cliffs, the alluvial plains with wetlands, coastal lagoons and salt-pans and the shallow waters of the Slovenian sea. In times of dramatic EUNETMAR Country fiche SLOVENIA Country fiche – SLOVENIA - January 2014 10 climate changes this has certainly contributed to a higher public expenditure for the protection of marine and coastal habitats.

Fisheries and aquaculture

The development and size of fisheries is mainly related to the expansion of the port of Koper, which has required several infrastructural improvements over the years. Fishing for human consumption: The fishing industry had been relatively important until the 1990s. Since then, it has been reducing considerably because Slovene fishermen could no longer practice unlimited fishing in Croatian territorial waters. At present, albeit shrinking, it still retains a certain importance among maritime activities. As one may imagine, most of GVA and employment is however realised by wholesalers, rather than in the primary sector. On the other hand aquaculture in Slovenia started at the end of the twentieth century. In 2009, 377 tons were farmed, 312 of which are shellfish The main species farmed are mussels, seabass and gilthead seabream. In 2007, three larger areas were designated for marine aquaculture in Slovenian territorial waters that were subsequently separated into 22 plots, for which concessions were granted for the use of marine water in 2009.

Blue biotechnology

The Research and Innovation Strategy of Slovenia (RISS) is the key strategic and political document of the Slovenian policy on research and innovation. It is currently implemented by the Ministry of Education, Science, Culture and Sport in collaboration with the Ministry of Economic Development and Technology and other relevant stakeholders, who have contributed to the development of the program. However, no documents are specifically devoted to Marine Biotechnology. A strategic document titled International Challenges 2013 - Partnership to promote international cooperation is currently in the process of being approved by the government. The document sets the priority economic sectors for international cooperation, among them also biotechnology (others of interest include biomedicine, energy and environmental technologies, advanced material and technology, nanotechnology). Among the key objectives defined in International Challenges 2013 there, are no specifically dedicated marine biotechnology strategies, plans or policies being implemented in Slovenia. But according to 2014 EUNETMAR Country fiche for Slovenia relevant research projects that de facto are setting the strategy are carried out at the Marine Biology Station based in Piran. The fields of interest are: coastal sea, marine debris removal and prevention, remote surveillance of toxins and pollutants, the study of biological phenomena, jellyfish blooms mechanisms and mitigation and the possibilities for commercial use, sustainable aquaculture, ecological interactions in the North Adriatic sea.

According to the SkillsAgendaFactsheets, in Slovenia the skills and education statistics is as following:

Educational attainments of adults:

- 67 % of students in Vocational Education and Training (VET)
- 42.6% of adults (30-34) with higher education / 38,5% in the EU
- 12% of adults in lifelong learning / 11% in the EU

30.1 % of employers who encounter difficulties in finding employees with the right skills / 40% in the EU
68% of companies financing training to their employees / 66% in the EU
52.2%: employment rate in % of low skilled young people / 53,1 in the EU
74.3%: employment rate in % of high skilled young people / 80,5% in the EU

1.9 Spain

a) Introduction and national context

In 2011, 87.3% % of the students were enrolled in public universitities[35]. In 2012, they were 50 public universities and 29 private universities in Spain[36].

In 2016, 41.1% of adults (30-34) have a higher education qualification (38.5% in the EU) and 10% of adults are enrolled in lifelong learning (11% in the EU)[37]. 34% of students are in vocational educational training[38]. To access higher education in Spain, future students have to both obtain their degree at the end of high school and to pass a mandatory exam. The results of this exam is conditioning access to selective trainings and universities[39]. In 2010, public expenditures spent on research and development raised to 1.39% of GDP, while public expenditures for innovation raised to 1.67% of GDP. In 2010, 20% of public grants awarded for research to universities was allocated to life sciences and agribusiness, 30% to environment and national resources, 32% to production and communications technologies, and 19% to social sciences[40].

Private companies, research centers and universities are working together in the various Scientific and Technological Parks (Parques Científicos y Tecnológicos, PCT), in order to boost innovative scientific and technological entrepreneurship, foster technology transfer and enhance knowledge[41].
For examples:
Parques Científicos y Tecnológicos in Madrid: http://fpcm.es/
Parques Científicos y Tecnológicos in Castile: http://www.pctclm.com/el-parque/presentacion/

In July 2017, 38.6% of the youth population and 17.22% of the total population is unemployed[42]. 54.1% of low skilled young people (53.1 in the EU) and 68.6% of high skilled young people (80.5% in the EU) have a job[43]. In 2016, 23.8% of Spanish employers say they encounter difficulties in finding employees with the right skills (40% in the EU) and 75% of companies are financing training to their employees (66% in the EU). Top 3 of growing occupations in Spain are agricultural, forestry and fishery labourers; engineering professionals (excluding electrotechnology); physical and earth science professionals[44].

[35] http://www.campusfrance.org/sites/default/files/fiche_curie_espagne_1.pdf
[36] http://www.campusfrance.org/sites/default/files/fiche_curie_espagne_1.pdf
[37] http://ec.europa.eu/social/keyDocuments.jsp?langId=en&mode=advancedSubmit&advSearchKey=SkillsAgendaFactsheets
[38] http://ec.europa.eu/social/keyDocuments.jsp?langId=en&mode=advancedSubmit&advSearchKey=SkillsAgendaFactsheets
[39] http://www.campusfrance.org/sites/default/files/fiche_curie_espagne_1.pdf
[40] http://www.campusfrance.org/sites/default/files/fiche_curie_espagne_1.pdf
[41] http://www.campusfrance.org/sites/default/files/fiche_curie_espagne_1.pdf
[42] http://tradingeconomics.com/spain/youth-unemployment-rate
[43] http://ec.europa.eu/social/keyDocuments.jsp?langId=en&mode=advancedSubmit&advSearchKey=SkillsAgendaFactsheets
[44] http://ec.europa.eu/social/keyDocuments.jsp?langId=en&mode=advancedSubmit&advSearchKey=SkillsAgendaFactsheets

c) *Sample of available trainings in the blue growth area*

Below are some initiatives in blue growth trainings, from information and dissemination workshops about blue growth to large Master degrees included in training of important Spanish universities or even training programmes within the Spanish public bodies funded by European Social Fund.

Blue Growth training at national level is expanding, especially since 2014. Most of the training initiatives are at graduate and post-graduate level.

In universities, various trainings are related to tourism and activities related to tourism. For examples, the *Institute of Sustainable Tourism and Economic Development*, TIDES, which belongs to the University of Las Palmas de Gran Canaria (ULPGC), launched in 2013-2014 a Master degree in **tourism, transport and environmental economics**, that is entirely taught in English.
http://www.tides.ulpgc.es/formacion/master.html

This institute also developed trainings in **nautical sports management**, with the objective to both develop economical activities and protect natural sites and heritage in the coastal areas.
http://www.tides.ulpgc.es/investigacion/lineas-de-investigacion/257-economia-azul-analisis-del-turismo-costero-y-maritimo.html

In 2014, the University of Pompeu Fabra, the University of Balearic Islands and the Tecnocampus Mataró Foundation in Cataluña launched a Master degree on **nautical tourism**. The training will develop innovative tourism to boost competitiveness of this growing sector in Spain.
http://www.lavanguardia.com/economia/20141028/54418635988/la-demanda-de-la-costa-mediterranea-impulsa-la-creacion-del-postgrado-en-turismo-nautico-y-de.html

Another example of the development of blue growth related trainings in Spain is the launch of the Master in **Nautical and Subaquatic Archeology** in the Faculty of Philosophy and Literature at the University of Cadiz in 2016. Three itineraries are offered to the 30 students of the Master: documental written resources for the nautical and subaquatic archaeology; nautical and subaquatic archaeology in the antiquity; and nautical and subaquatic archaeology in the Middle and Modern Ages.
http://www.campusdelmar.com/en/2016/10/27/the-university-of-cadiz-celebrates-the-first-edition-of-the-official-master-in-nautical-and-subaquatic-archaeology/

Universities are also developing trainings related to biology and natural resources, and dedicated to sustainable development.
For example, the University of Alicante has created a Master Degree on **Sustainable Fisheries Management**. This multidisciplinary training will develop knowledge in biology, economics, sociology, law, mathematics, statistics, surveys, evaluations and negotiation.
http://ciencias.ua.es/es/estudios/master/gestion-pesquera-sostenible.html
Universities are also focusing on knowledge development. For example, the University of Basque Country has a Master Degree Erasmus Mundus on **Environment and Marine Resources**. Students are gaining knowledge about contaminants, climate change, fisheries and marine biotechnologies.
http://www.ehu.eus/es/ehuko-albisteak/-/asset_publisher/a1Fb/content/20140203_master_mer?redirect=http%3A%2F%2Fwww.ehu.eus%2Fes%2Fehuko-albisteak%3Fp_p_id%3D101_INSTANCE_a1Fb%26p_p_lifecycle%3D0%26p_p_state%3Dnormal%26p_p_mode%3Dview%26p_p_col_id%3Dcolumn-2%26p_p_col_count%3D1%26_101_INSTANCE_a1Fb_advancedSearch%3Dfalse%26_101_INSTANCE_a1Fb_keywords

%3D%26_101_INSTANCE_a1Fb_delta%3D10%26_101_INSTANCE_a1Fb_cur%3D139%26_101_INSTANCE_a1Fb_andOperator%3Dtrue

Besides initial trainings, universities are also organizing workshops and summer schools about blue growth issues. These growing activities are demonstrating the importance and the awareness of the country about blue growth issues.
For example, the International University Menendez Pelayo (Santander, Cantabria) organized a summer workshop on Blue Growth named "**Sustainable Development of the Fisheries and Aquaculture Sector**", within the workshops organized in the frame of SUCCESS H2020.
http://www.success-h2020.eu/success-workshops/
http://www.uimp.es/agenda-link.html?id_actividad=63PP&anyaca=2017-18
The CEI.MAR (Campus of International Excellence of the Sea) and the Andalusian Marine and Maritime Cluster both organized a workshop on "**Blue Minds**".
http://www.uca.es/wp-content/uploads/2017/07/Workshop-Blueminds.pdf
The CEI.MAR and the University of Cadiz launched summer lifelong trainings about "**Blue Economy**: Andalucía and the Sea".
http://www.uca.es/es/cargarAplicacionNoticia.do?identificador=6897
Finally, the University of Málaga has set 11 training actions on **Blue Jobs and entrepreneurship** in the Blue Economy.
http://www.saberuniversidad.es/actualidad/Economia-empleo-crecimiento-azul-mar-oportunidades-universitario_0_1123988327.html

Public institutions also launched a number of actions related to Blue Growth, like the Marine Social Institute that created the Maritime and Health Professional Training Programme, supported by ESF funding.
http://www.seg-social.es/Internet_1/Trabajadores/Trabajadoresdelmar/Formacion/FormMarSanitaria/PlandeFormacion2008/index.htm
Furthermore, the Ministry of Agriculture, Fisheries and Environment has organized various strategic training actions on aquaculture in different Spanish regions in 2016.
http://www.mapama.gob.es/es/pesca/temas/acuicultura/plan-estrategico/seguimiento/l6_nuevas_competencias_tcm7-444261.pdf

c)Case study: Combined Master Degree on Blue Growth

The Universities of Murcia and Cartagena and the Instituto Español de Oceanografía (IEO-Spanish Institute of Oceanography) launched an innovative Master Degree on Blue Growth called MUCA (Master Universitario en crecimiento azul-Master degree in Blue Growth), located in the Campus of International Excellence Ceimar, of the Sea and Mare Nostrum. It is the first Master training in Spain entirely dedicated to blue growth issues.
Students are gaining knowledge and skills on tourism, protection of heritage, management of coastal areas, fisheries, marine technologies, oceanography, aquaculture.
Classes include marine law, oceanography, blue economy, marine biology, agriculture, production of algae, coastal management, tourism…
http://sede.educacion.gob.es/cid/234859069203738236685380.pdf

Non-EU countries:

1.10 Albania

According to EUNETMAR Country fiche for Albania produced in year 2014 (https://webgate.ec.europa.eu/maritimeforum/sites/maritimeforum/files/Albania_cf.pdf) most relevant and promising marine and maritime activities in Albania are: marine aquaculture, coastal tourism, passenger ferry services and fishing for human consumption. According to the same document, data on marine and maritime activities were not available and authors had to reply on expert assessment rather than on other indicators.

With respect to education, barriers for growth have been identified in the EUNETMAR document. University of Tirana offers education on aquaculture and fishing for human consumption but there is weak vocational education. In relation to tourism, there are several Universities on a vocational school that provide education and skills related to tourism sector but overall there is poor education in this sector. EUNETMAR did not identify any education program or specialized education related to passenger ferry services. Overall, lack of young specialists has been identified.

Albania is a full member of the Bologna Process. There is a total of 21 accredited high education institutions in Albania (www.ascal.al/en/accreditation/accredited-institutions), and 251 active accredited study programs (https://www.ascal.al/en/accreditation/accredited-study-programs, web access on September 8th 2017).

In 2013 Department of Aquaculture and Fisheries (http://ubt.edu.al/sq/DAP) was established as the newest department of the Faculty of Agriculture and Environment at the Universiteti Bujqësor Tiranës. Before that, students wanting to get education in fisheries and aquaculture were obtaining their degrees as part of „Agrarian Engineer" program available since year 2001. Programs currently offered include bachelors degree Agrarian Engineering: Aquaculture and Fisheries Management, and Master of Science degree Agrarian Engineering: Aquaculture.

According to information available on the www, there is a European University for Tourism in Tirana that offers bachelor and master degrees in tourism (fondacionieuropa.org/the-courses-and-laboratories-at-european-university-for-tourism/, web access on September 8th 2017). It seems that this program is currently under accreditation procedure. Courses are held in cooperation with the European Universities and professional experts in tourism, and it seems to be largely based on human resources and expertise of Italian professors.

1.11 Algeria

a) Introduction and national context

In 2014, near 30% of population of Algeria was younger than 15. In 2012, 24% of relevant age group was enrolled in a higher education training[45]. 80% of the students have a scholarship. In Algeria, there are 22 private higher education institutions, but they are not acknowledged by the Ministry of Higher Education and Scientific Research. Algeria also has 48 public universities, including two technical institutes and one university for lifelong training; 13 National Higher Schools; 12 preparatory schools; 7 Normal Higher Schools (Écoles Nationales Supérieures); one technological institute[46].

On the economic level, most of Algeria's income is related to oil production. Nevertheless, the country is trying since recently to diversify its sources of incomes, for example with the development of renewable energies. In 2013, 6.1% of Algerian State's operating budget was allocated to scientific research and higher education[47]. Unemployment rate is up to 12.3% in April 2017 (it was 10.5% in September 2016). 29.7% of young people aged 16 to 24 are unemployed. Unemployment is affecting the whole population, those without qualifications as well as graduates of vocational training and of higher education. 17.6% of graduated people from higher education, 7.7% of unqualified persons and 14.8% of graduated people from vocational training are unemployed in April 2017[48].

Some trainings adopted an **eco-friendly approach**, like for example the Department of materials science and engineering of the ENSMM (École Nationale Supérieure des Mines et Métallurgie-Higher National School of Mines and Metallurgy). Students are studying different materials and methodologies, trying to minimize the impacts of the materials on the environment.
http://ensmm-annaba.dz/sciences-et-genie-des-materiaux/

Some research centers and universities are developing research on **micro-algae**:

- The CDER (Centre de développement des énergies renouvelables- Development Center of renewable energies) is working first on characterization and energy recovery of some bioenergetic resources, including algae, and second on the development of photobioreactors for the cultivation of microalgae
- The University of Oran and the Laboratory of environmental monitoring have a project on identifying marine algae
- The Department of biology of the University of Mascara is conducting research on antibacterial and antifungal properties of marine algae.[49]

Nevertheless, the public is not always aware and alerted enough on the environmental issues and on strategies of mitigation and reducing pollution. Aquaculture for example is

[45] http://www.diplomatie.gouv.fr/IMG/pdf/fiche-curie-enseignement_superieur_maroc_cle41f18d.pdf
[46] http://www.campusfrance.org/sites/default/files/ALGERIE_fiche_Curie_20_NOVEMBRE_2014__cle0835f1.pdf
[47] http://www.campusfrance.org/sites/default/files/ALGERIE_fiche_Curie_20_NOVEMBRE_2014__cle0835f1.pdf
[48] http://www.tsa-algerie.com/hausse-du-taux-de-chomage-les-jeunes-les-plus-affectes/
[49] http://www.ipemed.coop/adminIpemed/media/fich_article/1472740289_ipemedetudes-et-analysesrapport-microalgues.pdf

a growing sector in Algeria, but its development is more production-oriented rather than sustainable.

Algerian universities and research centers have developed strong cooperation links with other organizations from other Mediterranean countries like France and Italy, working on common topics related to the protection of the environment.

b) Sample of available trainings in the blue growth area

The Department of Ecology and Environment of the Faculty of Biological Sciences of the University of Sciences and Technologies Houari Boumediene offers various trainings at Bachelor, Master and PhD levels:
Bachelor in marine ecology and environment
Bachelor in vegetal ecology and environment
Bachelor in parasitology and microbiology
Master in Biological Oceanography and Marine Environment
Master in Protection and Management of the Marine Environment
Master in Coastal Oceanography and the Marine Environment
Master in Fisheries Operations and Management
Master in Plant Ecology and Environment
Master in Biodiversity and Evolutionary Ecology
Master in Ecology of arid zones
Master in Environmental Management
Master in Conservation of Biodiversity and Sustainable Development
Master in Parasitology, Biology, Ecology and Environment
PhD in vegetal ecology and environment
PhD in Coastal Oceanography and Marine Environment

http://www.usthb.dz/fbiol/spip.php?article315

c) Case study: ENSSMAL

The ENSSMAL (École Nationale Supérieure des Sciences de la Mer et de l'Aménagement du Littoral-High National School of Sea Sciences and Coastal Management) is both a training and a research center in the fields of oceanography and coastal management. The school offers multidisciplinary trainings at Bachelor (engineering), Master and PhD levels for future executive and researchers in sea sciences. It also provides life-long trainings.
http://www.enssmal.dz/fr/index.php?option=com_content&view=featured&Itemid=435

The ENSSMAL has created laboratories with different specializations:

- Laboratory of marine biology
- Laboratory of cellular and molecular biology 1
- Laboratory of cellular and molecular biology 2
- Laboratory of geology and planning
- Laboratory of chemistry and pollution
- Laboratory of aquaculture

http://www.enssmal.dz/fr/index.php?option=com_k2&view=item&layout=item&id=357&Itemid=986

The ENSSMAL has developed collaboration and projects with both local and international organizations, as well as organizations and companies from the private sector.
http://www.enssmal.dz/fr/index.php?option=com_k2&view=item&layout=item&id=152&Itemid=819

ENSSMAL offers post-bac trainings in five years in marine sciences engineering in one of these five sectors:

- marine and continental hydrobiology (major: aquaculture, fishery, biodiversity, marine biotechnology)
- geography and management of the coastal zone (major: management of the coastal zone)
- geography (major: marine environment engineering)
- maritime engineering (major: coastal engineering)

http://www.enssmal.dz/fr/index.php?option=com_k2&view=item&layout=item&id=132&Itemid=882

ENSSMAL also offers two different PhD:
PhD: Coastal and marine environment
with two options**:** 1- Marine Environment and 2- **Coastal and marine** geosciences

PhD: Exploitation of *ichthyologic* **Resources**
with two options**:** 1- Management of fishing resources and 2- **Aquaculture and marine biotechnology**
http://www.enssmal.dz/fr/index.php?option=com_k2&view=item&layout=item&id=144&Itemid=811

1.12 Bosnia-Herzegovina

Coastal length and territorial sea of Bosnia and Herzegovina are rather small (24 km and ~140 km^2, respectively), and this area is entirely surrounded by Croatia's internal waters. Blue growth potential of this country is not significant. According to EUNETMAR Country fiche for Bosnia (https://webgate.ec.europa.eu/maritimeforum/sites/maritimeforum/files/Bosnia_cf.pdf) publish in year 2014, there were no maritime activities related to shipbuilding, ship repair, maritime transport, energy and raw materials, yachting and marinas or cruise tourism. Few enterprises involved in fishing for human consumption and marine aquaculture were identified, and most important marine and maritime activity was coastal tourism. According to same document two marine and maritime activities with most future potential in Bosnia and Herzegovina are Coastal tourism and marine aquaculture. This document did not identify any drivers of growth for these two activities with respect to education, training and skills. With respect to barriers, coastal tourism was identified as seasonal activity with difficulties to hire people in the summer. For marine aquaculture, lack of specific education programs in this field has been identified.

There are total of 25 accredited higher education institutions in Bosnia and Herzegovina (http://hea.gov.ba/akreditacija_vsu/Default.aspx), and two institutions with conditional accreditation.

University of Mostar in Mostar (http://sve-mo.ba/university-of-mostar/) offers bachelor and master degrees in Tourism and environmental protection, while Herzegovina University (http://hercegovina.edu.ba/hr/) located in the same city offers bachelor and master degrees in Tourism and ecology and Tourism and recreation. Further on, Herzegovina University also offers master degree program in Tourism and gastronomy, and PhD program in Tourism. Several other study programs related to tourism are available in this country.

University of Mostar offers bachelor, master and PhD degrees in Agronomy and related fields. Some of the courses offered are related to fisheries and aquaculture. Faculty of Agriculture and Food Sciences, University of Sarajevo (http://www.ppf.unsa.ba/#) offers bachelor and master degrees in Aquaculture, and PhD program in Agricultural sciences. These programs are mostly oriented toward freshwater ecosystems, that can provide essential background for students interested in marine aquaculture issues.

1.13 Egypt

The Ministry of Higher Education and Scientific Research of Egypt has a number of important responsibilities:

- To propose higher education policy,
- To set the plans, projects and programs necessary to implement this policy,
- To put the means that lead the spreading university and higher education in light of the current and future needs of the country,
- to develop the means that lead to strengthen the relationship between universities, colleges and higher institutes, on one hand, and the environment, on the other,
- to realize the best public service to society, as well as
- to supervise the Egyptian cultural bureaus and centres overseas, and the foreign cultural relations.
- It also supervises the Academy of the Arabic Language and the National Committee of UNESCO (https://www.zsi.at/en/object/partner/2564) .

Egypt has two kinds of higher education institutions. Higher professional education is provided by the Higher Institutes (ma`had âlî) which offer 4-year programmes, concluding with the bachelor's degree. In most cases, the Supreme Council of Universities considers this degree as being equivalent to a bachelor's degree awarded by a university. There is a large number of Higher Institutes, both state-run and private. The Ministry of Higher Education, under whose supervision they also fall, recognizes the latter. Higher education is also provided by universities (jâmi`a), which offer both academic programmes as well as higher professional education

There are 25 state-run universities, and there and 20 private universities (*http://www.capmas.gov.eg/Pages/StaticPages.aspx?page_id=5035) as shown in the table bellow*. The number of graduates in 2015 was for instance 252 687 within public universities and 9116 within private ones. Most private universities are recognized by the Ministry of Higher Education. Universities have a considerable amount of freedom in setting their curricula. The Supreme Council of Universities is the umbrella organisation that coordinates education at universities (https://www.nuffic.nl/en/publications/find-a-publication/education-system-egypt.pdf).

Table 2.13: Total number of the Teaching Staff & Their Assistants in Governomental and Private Universities
http://www.capmas.gov.eg/Pages/StaticPages.aspx?page_id=5035

Governmental universities		**Private Universities**	
University	**Total**	**University**	Total
Cairo	12166	American	442

Alexandria	7378	6 October	642
Ain Shams	10401	October Modern Science &Arts	897
Asyout	3747	Misr Technology &Science	895
Tanta	3978	Misr International	316
El Mansura	4719	El-Ahram Canadian	226
El Zagazig	6078	British	461
Helwan	4021	French	56
El Menia	2929	The Egyptian- Russian	331
El Menoufia	3025	Sinai	263
Suez Canal	2158	Faros	561
South El Wadi	1227	Modern for Information & Tecnology	427
Al-Azhar	13244	Future	384
Fayoum	1591	El Nile	61
Beni-suef	1868	El Nahda	374
Kafr-El-Sheikh	1036	Delta Science and Technology	250
Banha	3574	Technology	68
Suhag	1524	El Misria for Electronic Education	13
Port said	997	Open Arab	
Damanhur	983	Germany	
Suez	335		
Damietta	793		
Aswan	693		
Sadat	495		
Al Arish	264		

Marine Transportation

The ports of Alexandria, Hurghada, Nuwibaa, Port Said, Safaga, Sharm el Shiekh and El-Sokhna are the main ones that contributed to a traffic of over 1 milion of passenger (departures/arrivals). In 2014 over 16000 cargo vessels contributed to 48/123 million tons of loaded/unloaded cargo (http://www.capmas.gov.eg/Pages/StaticPages.aspx?page_id=5035) . Quite an extensive pressure to the environment considering that over 17000 cargo vessel passed the Suez Canal transporting over 962 billion tons of cargo of different type and the numbers increase each year. Among the Egyptian Universities there are several educating the students to confront the challenges of tomorrow and either (Faculty of Maritime Transport and Technology -**Arab Academy for Science, Technology and Maritime Transport).**

Tourism

Tourism in Egypt represents quite an important industry. Even in the period 2014/2015, this activity reached and increase in GDP of 17.7% on an annual base. Presumably due to known political reasons (terrorist incidents) the GDP in 2015/2016 decreased for 28,5 %. This is of course a cumulative value of both marine and land tourism. The Egyptian coastal cities have several different natural potentials, which could make them promising economic cities. **Urban development, navigation, ports and harbours development and recreation** on one side and **fisheries, aquaculture, agriculture and mining** on the other are the main resources that attract tourists and foreign investors. However some of these resources my negatively affected the regional development and the environment (https://doi.org/10.1016/j.hbrcj.2012.10.009). Egypt coastline possesses a significant proportion and considerable range of the coral reefs found in the Red Sea with about 3800 Km 2 of reef area and 1,800 km long (http://meea.sites.luc.edu/volume14/PDFS/MEEA%202011%20Coral%20reefs%20and%20tourism%20in%20Egypts%20Red%20Sea%2016%20mai%202011_3.pdf). There are several faculties education undergraduate students on the subject (**Faculty of Tourism,** University of Alexandria, http://tourism.alexu.edu.eg/index.php/en/ , **Faculty of Tourism & Hotels, 6th October University,** http://www.o6u.edu.eg/Faculties.aspx?FactId=21&id=133**, Faculty of Tourism and Hotels, Mansoura university, (**http://thfac.mans.edu.eg/en/**)**

Biotechnology

According to ISESCO (Islamic Educational Scientific and Cultural Organization), the biotechnology research in majority of the Islamic countries is at a low level. The lack of an adequate infrastructure, skilled work force and the lack of commitment by the national governments are the main reason of it. However, Egypt is one of the few Islamic countries that has Centres of Excellence in Biotechnology. NRC (http://www.nrc.sci.eg/) Is the largest multidisciplinary R&D centre in Egypt devoted to basic and applied research within the major fields of interest. With over 7000 in research staff, it consists of 14 divisions and 108 departments covering the major areas of industry, health, environment, agriculture, basic sciences and engineering.

Aquaculture and fisheries

According to FAO (http://www.fao.org/fishery/countrysector/naso_egypt/en) aquaculture represents about 65% od the total fish distribution and 99% of it derives from private fish farms. The majority of the fish farm is concentrated around the Nile delta, but no accurate statistics exist on the number of people involved in aquaculture and related activities. Although aquaculture production in 2009 in Egypt reached 705 490 tonnes, the majority of the production is either freshwater or brackish fish species. Marine and brackish is still in its early stage influenced by technical and economic problems. Aquaculture is considered to be the only possible solution to increase fish production in Egypt. In its development strategy, the Ministry of Agriculture and Land Reclamation, plans to increase Egypt's total fish production to 1.5 million tonnes by 2017 and is targeting a harvest of 1 million tonnes from aquaculture.

Protection of habitats in Egypt

Nature conservation in Egypt is the responsibility of the Ministry of State for Environmental Affairs (MSEA). While the establishing and managing of the national protected areas relies on the Egyptian Environmental Affairs Agency and the Nature Conservation Sector. By 2011 Egypt has protected its natural resources and marine biodiversity in a network of six Marine Protected Areas that are generally located in the Gulf of Aqaba and the Red Sea; most of them include interconnected marine and terrestrial sectors based on conserving coral reefs and accompanying systems. Two additional areas in the Mediterranean Sea in 2011 have been planned to be protected in the near future. A sufficient legal framework, well-trained staff, suitable management plans and substantial income from tourism are the positive feedback of the activity. However, additional funding is necessary to improve the management and some impact problems (pollution problems caused by the tourism and illegal fishing) are yet to be resolved (https://www.researchgate.net/publication/235662593_Status_of_marine_protected_areas_in_Egypt).

1.14 Israel

In Israel the institutions of higher education operate under the authority of the Council for Higher Education. The minister of education heads the Council. The Council authorizes the awarding of academic degrees and advises the government on the development and financing of higher education and scientific research (http://www.mfa.gov.il/mfa/aboutisrael/education/pages/education-%20higher%20education.aspx).

In the academic year 2013/14 there were 7 research universities and the Open University of Israel, 37 academic colleges (21 of which are budgeted by the planning and budgeting Committee-PBC and 16 are non-publicly funded colleges) and 21 academic colleges of education (teacher-training colleges).

Table 3.14: The list of Israel Universities and areas of specialization.

List of Universities	**Area of specialisation, courses offered**
Bar-Ilan University	Jewish heritage through basic courses in Jewish Studies
Ben-Gurion University of the Negev	Engineering Sciences, Health Sciences, Natural Sciences, Humanities and Social Sciences, and Business and Management.
Tel-Aviv University	Life Sciences, Medicine and Neuroscience, Exact Sciences, Engineering **&** Nano, Social Sciences, Environment, Law **&** Management, Arts, Humanities **&**Education
The Hebrew University of Jerusalem	The University aims to educate public, scientific, educational and professional leadership, to preserve Jewish, cultural, spiritual and intellectual heritage
The Open University of Israel	more than 40 undergraduate programs of study in the Humanities, Social Sciences, Natural Sciences, Mathematics, Computer Science and Engineering
The Technion – Israel Institute of Technology	The areas of research expanded and faculties for teaching are: biology, agricultural engineering, aeronautical engineering, food engineering, materials engineering, industrial engineering and management and technological education. Special departments are dedicated to mathematics, chemistry and physics as well as for humanistic and artistic studies.

The University of Haifa	Study areas include humanistic studies,study of Social Sciences,Natural Sciences, the study of Law, the Social Welfare and Health Sciences, and the Faculty of Education.
The Weizmann Institute of Science	The Institute has five faculties (biology, biochemistry, chemistry, physics and mathematics and computer sciences)

Some of the universities are theology oriented, but many of them are oriented toward **Blue (Green) Growth capacity building**. Israel is a member of the European Research Area and qualifies for European funding. There are several *Centres of marine biotechnology research:*

- The National Center for Mariculture at Eilat, Ben-Gurion University, the Negev;
- the Hebrew University of Jerusalem,
- the IOLR (Israel Oceanographic and Limnological Research Institute;
- The Kinneret Limnological Laboratory works on some microbial aspects of the Sea of Galilee, including toxin production in cyanobacteria;
- the NIO (National Institute of Oceanography, based at Haifa, Technion (Israel Institute of Technology),
- Tel Aviv University Center for Renewable Energy and the Weizmann Institute.

(http://www.marinebiotech.eu/wiki/Marine_Biotechnology_Middle_East_summary)

Israel is an education-rich country. The percentage of Israelis with tertiary degrees is much higher than the OECD average (46% versus 30%), and it is higher than that of each of the comparison countries. At the same time, the percentage of those with low levels of education is quite low: 18% in Israel versus an OECD average of 26% (http://meyda.education.gov.il/files/minhalcalcala/facts.pdf).

Already in 1999, the Israeli government proposed new policies that included the preservation of the public designation of the coast, the preservation free public access to the coast and the preservation of a free and open view to the sea. The same policy promoted a transparent, shared and open planning process, a comprehensive coastal planning vision, coastal planning and development on the basis of comprehensive environmental analysis of the coast, preservation of a building-free coastal strip. According to the new policy, all coastal locations were supposed to become reserved for uses, which are of vital importance for the coastline. The intensive building was supposed to be distanced from the coastal vicinity thus preserving the landscape and historic assets. The priority was given to reconstruction and renewal projects and to the promotion of environment-friendly public transport (http://www.sviva.gov.il/English/env_topics/marineandcoastalenvironment/Documents/CoastalZoneManagementInIsrael-Report-sept1999.pdf)).

Israel's main maritime activity concerns maritime transport, fishing activities, aquaculture, Seawater desalination, oil and gas production, offshore wind farms.

With three large ports and several marinas the maritime transport is of relative importance for the coastal economy. Seawater desalination is a very well advanced activity in Israel, with three plants active. Oil and gas production relies on two natural gas fields off the Israeli shore. These are major suppliers of energy to Israel (https://ec.europa.eu/maritimeaffairs/sites/maritimeaffairs/files/docs/body/israel_01_en.pdf).

Although Israel has a long coastline, there are only a very few small protected areas along its coast and in the sea. Since most of the country's population is concentrated in the coastal zone, the conservation of the marine and coastal areas is a difficult task, and should be prioritized (http://www.cbs.gov.il/www/hodaot2006n/env-compendium.pdf).

Tourism represents ~ 2% of the annual GDP and employes 3.3% of the population. But the major part of this tourism is restricted to the inland historical and religious touristic sites (http://www.cbs.gov.il/www/hodaot2006n/env-compendium.pdf).

On October 2011, Israel's cabinet approved a proposal put forth by the Ministers of Environmental Protection and of Industry, Trade and Labor to prepare a national green growth strategy for the years 2012 - 2020. That decision defines green growth as "socio-economic growth and development that does not harm the environment, makes efficient, economical and sustainable use of natural resources, and creates green jobs, while maximizing opportunities for using clean growth engines and emphasizing the decoupling of economic growth from environmental deterioration. The goal is to create new jobs, create new markets, to Improve the competition, promotion of R&D and of technologies for export, reduce of import and utilization of raw materials, stimulate a more efficient and fair distribution of natural resources and reduce the financial costs of environmental degradation (http://www.sviva.gov.il/English/env_topics/GreenGrowth/Pages/GreenGrowthIndicators.aspx#GovXParagraphTitle2)

The process initiated by the October 2011 government decision has led to policy and regulatory initiatives aimed at implementing the green growth strategy that is applied on **land and sea**. Israel is moving forward on a number of fronts: drafting a green licensing law, planning for a green growth knowledge centre, advancing green taxes, designing training programs for green jobs, promoting green procurement, publishing anti-greenwash guidelines and launching a material and waste management research centre.

A special inter-ministerial committee published an initial document on green growth indicators in December 2011. The report, entitled "Green Growth Indicators in Israel 2011" (Hebrew only) distinguished between three categories of indicators:

- **Outcome indicators** of the green growth plan, which aim to assess the economic outcomes that directly result from the implementation of the plan's policy tools in the short and medium range, and allow for quick adaptation of the implementation policy (e.g. green jobs, gross domestic product in environmental sectors etc.)
- **Benchmark indicators** for green growth, which aim to reflect the overall, long-range progress of the State of Israel toward green growth from a wide perspective ("Green GDP" - domestic product minus environmental costs, resource use intensity and resource productivity - water, energy and raw materials)

- **Dashboard indicators**, which provide a more segmented and detailed picture of different aspects of the green growth plan and are designated for professionals (environmental efficiency of production and consumption, environmental quality of life).
  (http://www.sviva.gov.il/English/env_topics/GreenGrowth/Pages/GreenGrowthIndicators.aspx#GovXParagraphTitle2)

1.15 Lebanon

The Directorate General of Higher Education, which is a part of the Ministry of Education and Higher Education, is responsible for higher education in Lebanon. There are three types of institutions that offer higher Education in Lebanon: the Universities, University Colleges and University Institutes. A University College or University Institute must have at least one faculty and usually only issues bachelor's degrees. A university must have at least 3 faculties, of which at least one is a humanities faculty and at least one is a natural sciences faculty. They are authorised to issue all academic degrees from bachelor's degrees to doctorates. At many universities, the language of instruction is English or French. Only one university is public: the **Lebanese University**. About 39% of the total number of students in Lebanon study at this university. All other higher education institutions are private institutions (https://www.nuffic.nl/en/publications/find-a-publication/education-system-lebanon.pdf).

Table 4.15: Lebanese Universities and the teaching staff in the period 2011-2013 involved according to: http://www.cas.gov.lb/index.php/statistical-yearbook#time-series-2011-2013).

University	Professors	University	Professors
Lebanese University	6,650	Ecole Supérieure des Affaires	124
Beirut Arab University	822	Université Antonine	436
Université Saint-Joseph	1,107	Canadian Hariri University Group for Sciences and Technology	171
American University of Beirut	1,264	Université de Technologie et de Sciences Appliquées Libano-Française	132
Université Saint-Esprit Kaslik	877	Lebanese German University	126
Lebanese American University	347	Kafaat University	122

Haygazian University	103	American University for Technology	94
Notre Dame University	517	Université Sainte famille	54
Daawa University Institute for Islamic Studies	30	Sidon for Culture and Higher Education	15
Université de la Sagesse	302	Arts Sciences and Technology University of Lebanon	671
Imam Ouzai Islamic Faculty	65	American University for Culture and Education	335
Middle East University	31	AUST	451
Makassed University in Beirut	42	Lebanese Canadian University	117
Saint-Paul Institute for Philosophy and Theology	24	Modern University for Managment and Sciences (Damour)	146
Balamand University	1,328	Joya Technology University Institute	32
Theology Faculty for the Middle East	9	Arab Open University	130
Islamic University of Beirut	39	Lebanese International University	2227
Jinan University	372	Al Manar University	138
Tripoli Institute for Islamic Studies	32	Institute Rassoul Aazam for Health Sicences	85
Islamic University of Lebanon	509	Lebanese Red Cross	6

Major marine activities in Lebanon are Maritime Transport, Fishery, and Oil and gas production. The maritime transport is concentrated around Beirut, Lebanon's major port.

There are more than 2700 fishing boats in Lebanon and the majority is concentrated in the northern part. Between Lebanon, Cyprus and Egypt 17 potential oil or gas fields were located. By signing agreements with Cyprus, Lebanon delimited the Exclusive Economic Zone of each country and marked out undersea borders to facilitate future oil and gas exploration. Political conflicts at the southern border with Israel block the majority of activities while at the northern borders with Syria no activities are reported either, just the reasons are not clear (https://ec.europa.eu/maritimeaffairs/sites/maritimeaffairs/files/docs/body/lebanon_01_en.pdf). According to some sources of information, there are two protected areas along the Lebanon coast. One is the Palm Islands Nature Reserve in the North and the second is Tyre Coast Nature Reserve in the South. And the management of these areas is given to the Ministry of the Environment (MoE) and the International Union for Conservation of nature (IUCN) (https://www.iucn.org/regions/mediterranean/projects/completed-projects/protecting-marine-biodiversity-lebanon). Freshwater aquaculture is carried out in Lebanon since the 1930s, but it is mostly freshwater. Marine aquaculture does hardly exist. However, a new farm for shrimp production has emerged very recently in the Akkar area of northern Lebanon. Total fish production (capture and aquaculture) accounts for less than 33 percent of local consumption. Aquaculture contributes about 10 percent of local production and 4 percent of local fish consumption (http://www.fao.org/fishery/countrysector/naso_lebanon/en).

How is higher Education system in Lebanon prepared to cope with blue growth? The majority of the Universities is located in the coastal area. At Some specific Universities like the Al-Manar University faculty programmes like Architecture & design, Arts & Human Sciences, Business Administration, Engineering, IT & Maritime Studies, Public Health, Science and Tourism represent very different programmes despite but very likely a limited number of students.

Although several Lebanon Universities have biotechnology courses (Lebanese University, Holy Spirit *University* of Kaslik, American *University* of Beirut) there is not an exact information of how many such courses are accredited in total and how many students finish the studies. For sure, postgraduate studies at the Lebanese University (Faculty of Science) comprises also the study of Applied Plant Biotechnology and Marine Biology and Ecology (https://www.ul.edu.lb/faculte/branches.aspx?facultyId=6). There are some cases where the University is involved as a partner in EU funded biotechnological projects. The American University of Beirut e.g. is a partner in the EU-funded project MAREX (marine bioactives) http://www.marinebiotech.eu/wiki/Marine_Biotechnology_Middle_East_summary .

An FAO study from 2011 found bad conditions in the Fishery sector especially not appealing to young people. Additional efforts are necessary to change this situation in making the fishing more attractive to both the fishing industry and the consumers and raise the level of production and product quality. One of the main reason of the bad situation is, according to the study, is related to the use of wrong tools and techniques that cause the capture juvenile and small fish and the lack of information on fish resources in the Lebanon EEZ (http://www.faoeastmed.org/pdf/publications/EastMed_TD09.pdf)

1.16 Libya

Insight into higher education in Libya is available from document "The Reality of Higher Edication in Libya" published by Libyan Organisation of Policies & Strategies in 2016 (http://loopsresearch.org/media/images/photo1y463soniq.pdf). This document provides information on history of establishing universities in this country as well as on structure of higher education. According to information provided, second half of 20th century was characterized by opening of larger number of higher education institutions in Libya and this process was random and disorganized. Currently there are 12 Universities and 100 institutes that participate in higher education programs. Document points out that there is a very low number of higher education students compared to the total population of the country. Furthermore, it points that there is a number of scholarship recipients who are send to foreign universities but that there is no plan for gaining benefit from them once they return home. Concerns have been raised that there is lack of laboratory technicians and adequate equipment for providing adequate quality and quantity of educational experience for students. Overall, situation with infrastructure at Universities, with several exceptions, seems to be quite concerning. Many of the private Universities and Institutes are not accredited by the department of Quality Control in Higher Education Institutions and they are not adhering to the required quality standards. According to this document, spread of universities and institutes is not linked to educational objectives, demographic and cultural characteristics, national economy or labor market.

Several universities in Libya offer high education programs related to Blue Growth including Marine Engineering and Naval Architecture. However, overall information in English language is limited and it is hard to fully evaluate education programs related to Blue Growth potential.

1.17 Monaco

Monaco has one university, the International University of Monaco, a Training Institute in nursing care (IFSI), and a Higher School of Arts (ESAP). Two high schools, Albert 1er High school and the technical and hotelier high school, are offering higher education diplomas (technician certificate, BTS). However, none of the trainings offered in Monaco are related to blue growth domains.

The **Oceanographic Museum of Monaco** was inaugurated in 1910, with the aim to showcase the many species that scientists discovered during scientific campaigns. The museum is a link between scientists and citizens, and aims to spread knowledge on biodiversity among the public. The museum is playing a key role in conservation and reproduction of many endangered species like coral and clownfishes. One of the aquariums is entirely dedicated to Mediterranean fauna.
http://www.oceano.mc/en

The Prince Albert II of Monaco Foundation, the Oceanographic Institute and the Foundation Albert I, Prince of Monaco organize yearly since 2010 the **Monaco Blue Initiative (MBI)**. The MBI is a platform for discussion between scientists, business representatives and policy makers about future global challenges of ocean management and conservation, that aims to foster possible synergies between the protection of marine environment and socio-economic development.

1.18 Montenegro

According to the country fiche for Montenegro that has been produced by EUNETMAR in 2014 (https://webgate.ec.europa.eu/maritimeforum/sites/maritimeforum/files/Montenegro_cf.pdf), four main marine and maritime activities with most future potential in this country are cruise tourism, yachting and marinas, coastal tourism and mariculture. It is stated that contribution of tourism to GDP is at the level of 15% and growing, with the predominant share of tourism in the coastal area. GDP per capita was EUR 5.211 (MONSTAT). Beside the contribution to the total GDP, it should be highlighted that tourism employs 27% of people of the country. The entire coastal area is developed in order to offer tourist services and is still in phase of development. Most of the other activities may be seen as collateral activities, and those which are more related to tourism are also those that can develop faster, due to the economic interest of investors and the political interests of the country.

With respect to education, barriers for growth have been identified in the EUNETMAR document. University of Montenegro comprises of 19 faculties in 4 cities: Podgorica, Nikšić, Cetinje and Kotor. Faculty of Natural Sciences and Mathematics (www.pmf.ac.me) is situated in Podgorica and has close cooperation with Institute of Marine Biology (www.ucg.ac.me/ibm) in Kotor which is responsible for marine aquaculture and fisheries issue on national level. However, lack of researches and professionals and need for expert assistance are recognized as main barriers for future growth and implementation of EU Common Fisheries Policy. National fisheries strategy deals with overcoming of problems such as the use of obsolete equipment, lack of research centres and insufficient capacity for scientific monitoring, key food safety issues in order to achieve a good and healthy final product. Other measure of the strategy for Montenegro, as one of the accession states, is harmonization of legislation with the EU Common Fisheries Policy.

In relation to tourism, there is a Faculty of Tourism and Hotel Management in Kotor (http://www.ucg.ac.me/fth), as organisational unit of University of Montenegro. It was founded in 1999, with the aim of providing multi-disciplinary teaching and research in area of tourism in order to create high quality tourism offer. Before transformation into Faculty, there was the Higher Vocational School for Tourism, founded in 1967, and therefore it represents the educational institution with the longest tradition in tourism and hospitality education in Montenegro. It provides interdisciplinary and applicable study programmes on undergraduate and master levels as well as postgraduate, specialist studies and PhD studies. Furthermore, Faculty offers lifelong learning programmes which ensure to convey a high level of knowledge and competences to its students. Beside Faculty of Tourism and Hotel Management there are several International Language Centres like Foreign Language Center UDG Donja Gorica (cfl@udg.edu.me), but deficit of educated employees in management roles and need to import workers from other countries during the high season are listed as barriers for more pronounced progress in line with national strategy proposing preservation of natural resources and environment since it is one of the strongest potentials for coastal tourism in Montenegro. However, in order to increase the attractiveness of the coastal zone, it is of strategic importance to protect the cultural integrity, respect the basic environmental principles and protect biological diversity on one hand and to find the best

balance between economic, social and environmental requirement. Montenegro Tourism Development Strategy (www.mrt.gov.me) to 2020 gives particular attention to developing high-end tourism products not yet fully realized in Montenegro, such as yachting and golf, as well as a new brand of nature-based tourism. Human resource development strategy in the tourism deals with a problem of insufficient professional human resources, thus a specific Human resource development strategy in the tourism (www.mrt.gov.me) is focused on the education and training of staff.

In relation to maritime issue and ship building and repair, there is a Faculty of Maritime Studies in Kotor (http://www.ucg.ac.me/pfkotor), as organisational unit of University of Montenegro that has long maritime tradition and good standard of schooling. However, majority of Montenegrin crew works for foreign companies outside of Montenegro. There is no explicit national strategy for Passenger ferry service, Short Sea shipping and Shipbuilding and ship repair in Montenegro. Some of the concerned aspects are covered by the National Strategy of Sustainable Development in Montenegro to 2030 (http://www.nssd2030.gov.me/), some by the Montenegro Tourism Development Strategy to 2020 (www.mrt.gov.me) and also by Transport Development Strategy of Montenegro (www.seetoint.org/seetodocuments/1264). All of these Strategies are concentrated on resolving the problems of improving infrastructure and transport systems, where maritime transport should be combined with other forms of transports in order to be able to handle the increase of tourist and freight traffic with minimal negative impact on the environment and improved safety. One of the ideas is also to include more seasonal ferry lines.

1.19 Morocco

b) Introduction and national context

Morocco has 13 public and 5 private universities. One university has a special status: the English-speaking Al Akhawayn University in Ifran. Only 5% of the students are enrolled in a private higher education institution. Some of the trainings in public universities are selective and other are in open access. Two thirds of all trainings at university are taught in French, while high school and below are taught in Arabic. Besides universities, Morocco has 58 selective higher education institutions especially dedicated to the training of executive. Two of them are training students in architecture, urban planning and environment; four others offer trainings in agriculture, forests and sea sciences; and seven others are teaching life and earth sciences[50].

In 2015-2016, 801 966 students are enrolled in a higher education training; since 2009, 20% more students every year accessed higher education in Morocco; but still only 12% of relevant age group in 2012 could access higher education. This is less than other neighbor countries (Tunisia: 31% and Algeria: 24%). In 2014-2015, 15 000 foreign students were enrolled in a Moroccan higher education institution[51].

Students willing to study in vocational trainings can prepare a higher technician degree (BTS) or they can enroll in a professional Bachelor at university or in a DUT school (Higher Schools of Technology). The Office of vocational training and promotion of job (Office de la Formation professionnelle et de la Promotion du Travail), a state institution, is in charge of the management of institutions for vocational trainings in Morocco. Some private companies also created their own private trainings related to their needs in specialized skills and workforce[52]. For example, the Open Lab of PSA, the French car manufacturer, was created in 2016 together with the University Mohammed V in Rabat, the University Cadi Ayyad in Marrakech, the University Ibn Tofail in Kenitra, the Euro-Mediterranean University in Fes, the Central School of Casablanca, the Georgia Tech University (USA), the Mississippi State University (USA) and the La Fayette Institute (France). The Open Lab will enhance the development of research and collaborative work within Moroccan universities and foster international cooperation. It will contribute to the development of the factory of Kenitra. This factory, that should be operative in 2019, will be building 100 000 cars per year and also conduct research in supply chain, electrical vehicles and **renewable energies**[53].

In 2015, 20.8% of people aged 15 and 24 were unemployed and 13.9% of the 25-34. To compare, unemployment is concerning 5.5% of the population aged between 35 and 44, and 3% of the population aged above 45.[54] In 2016, 232 000 people aged 35 and above were unemployed, while 481 000 young people aged 25-35 and 392 000 people aged 15-24 were unemployed. Among the unemployed people, 854 000 graduated, while 251 000

[50] http://www.diplomatie.gouv.fr/IMG/pdf/fiche-curie-enseignement_superieur_maroc_cle41f18d.pdf
[51] http://www.diplomatie.gouv.fr/IMG/pdf/fiche-curie-enseignement_superieur_maroc_cle41f18d.pdf
[52] http://www.diplomatie.gouv.fr/IMG/pdf/fiche-curie-enseignement_superieur_maroc_cle41f18d.pdf
[53] http://www.diplomatie.gouv.fr/IMG/pdf/fiche-curie-enseignement_superieur_maroc_cle41f18d.pdf
[54] http://www.hcp.ma/downloads/Maroc-en-chiffres_t13053.html

have no degree, i.e. 4.5 times less people[55]. In 2014, 32.2% of the total population is illiterate. In particular, 11% of the population aged 15-24 is illiterate. 10.1% of the young people aged 15-24 has no educational background (6.1% of the men and 14% of the women).[56]

Agriculture, forestry and **fisheries** is the most important branch of activity in Morocco, with 39% of employed population. Second most important branch is trade with 13.9% of employed population, and third is industry with 11.2% of employed population.[57]

b) Sample of available trainings in the blue growth area

Master in Production and Valuation of Natural Substances and Biopolymers
University Cadi Ayyad
http://www.uca.ma//fr/training/master-production-et-valorisation-des-substances-naturelles-et-des-biopolymeres

Objectives :
-To gain knowledge in chemistry of natural substances and biopolymers, leading to a PhD and a career as researcher
-To become a professional in chemistry of natural substances (plants, marine organisms), in analysis and control, cosmetics, health, food industry, paper industry and others

Key features:
-Basic, scientific and technical training
-Adjustment of educational training to the socio-economic world and its needs at national and regional levels
-Development of industrial applications using processes based on non-polluting, renewable and eco-friendly products, development of new biodegradable materials for packaging or cosmetics.

Employment opportunities:
-chemical and pharmaceutical industry
-research and development
-agricultural industries
-chemical analysis centers, audits, quality control...

Access:
Bachelor degree

Higher-educational Degree of Technology in Renewable Energies
University Cadi Ayyad
http://www.uca.ma//fr/training/diplome-universitaire-de-technologie-energies-renouvelables

[55] http://www.huffpostmaghreb.com/2017/02/08/emploi-chomage-jeunes_n_14641432.html
[56] http://www.huffpostmaghreb.com/2017/08/12/au-maroc-jeunes-niveau-instruction_n_17736096.html
[57] http://www.hcp.ma/downloads/Maroc-en-chiffres_t13053.html

Objectives:
-To train the next generation of higher technicians in the renewable energies (solar, wind, hydraulic), a growing sector in Morocco

Key features:
-Graduated students will lead the development of a new energy policy in Morocco
-Great opportunities of development of renewable energies in Morocco: 3000 hours of sunshine per year, an estimated wind potential of 6000 MW, 200 sites identified for hosting micro-power plants using water resources, a large biomass deposit
-Morocco is willing to develop renewable energies and launched some initiatives to develop solar and wind energies

Employment opportunities:
-production, maintenance, design office, purchasing department, sales service and after-sales service
-consultancy firms, private companies, public administration and ministries, local administrations

Access :
High-school degree

Master in Tourism, heritage and sustainable development
University Cadi Ayyad
http://www.uca.ma//fr/training/master-specialise-tourisme-patrimoine-et-developpement-durable

Objectives:
-To establish a balance between tourists flows on the one hand and the need to preserve the heritage and the environment on the other hand
-Training of executives in sustainable development, especially for projects related to development of the cultural and natural heritage linked to sustainable development.

Key features:
Examples of classes: environmental policies, tourism economics, tourism and spatial planning, preparation of a professional project

Employment opportunities:
-manager in travel agencies, hotels and riyads, officials or representatives qualified for the Ministry or delegations of tourism, for municipalities and regional organizations...

Access:
Bachelor degree (Cadi Ayyad University offers bachelor in tourism)

Bachelor in Tourism Engineering
University Cadi Ayyad
http://www.uca.ma//fr/training/licence-professionnelle-ingenierie-du-tourisme

Objectives:
-To provide qualified and specialized multidisciplinary tourism training that takes into account both development and sustainability.
-To create links between the training and the workplace to create employment opportunities

Key features:
Examples of classes: tourism and heritage, tourism and natural risk management, itineraries and heritage tourism products, protected areas, environment and tourism, tourism economy

Employment opportunities:
-agents, managers and operators in the field of sustainable development, and more particularly in all projects for the tourist development of cultural and natural heritage with a view to sustainable development
-travel agencies, transport agencies, large companies such as Royal Air Maroc, hotels and ryads, Ministry or delegations of tourism, municipalities and regional administrations...

Access:
High-school degree

Bachelor in Geoenvironment and natural risks
University Cadi Ayyad
http://www.uca.ma//fr/training/licence-professionnelle-geoenvironnement-et-risques-naturel

Objectives:
-To train students in the environmental field, related to geology as a whole, including anthropic pressures
-To gain scientific, technical, social, legal and civic knowledge and skills, for the preservation of the environment (land and sea)

Key features:
-To train the next generation of stakeholders committed in the field of preservation of geological environment and prevention against geo-hazards in sub-aquatic and underwater environments.

Employment opportunities:
-Environmental engineering, natural hazards, land use planning, environmental protection and earth science
-Observatories, environmental agencies, local administrations, consultancy firms

Access:
High-school degree

The INRH (Institut National de Recherche Halieutique-National Institute of Fishery Research), a research institute specialized in aquaculture, monitoring of sea water quality, coastal and marine ecosystems, fishing techniques, fishery resources and

products, does not provide trainings in one of the blue growth domains, but it provides supervision of internships for students enrolled in Bachelor, Master or PhD. The institute is collaborating with many Moroccan universities, creating a link between theoretical knowledge and professional applications.
http://www.inrh.ma/

c) Case study: Euro-Mediterranean University of Fes

The private Euro-Mediterranean University of Fes, created in the framework of the Union for the Mediterranean, offers numerous multicultural and multilingual trainings in different fields, all related to the Mediterranean. Its vision is unity through cooperation and the sharing of knowledge and heritage and its ambition is excellence through innovation in higher education and research. This university aims not only to train the young generation; it also aims to make students become multicultural, in particular **to develop a Euro-Mediterranean profile**.

The Euro-Mediterranean University has many international university partners. It is for example member of the French group INSA (*Instituts Nationaux des Sciences Appliquées-National Institutes of Applied Sciences*). It has developed cooperation with other Moroccan universities (Cadi Ayyad Marrakech, Moulay Ismail Meknès, Mohammed V Agdal Rabat, Sidi Mohamed Ben Abdellah in Fès) and many European universities (University of Seville, Polytechnic University of Catalonia, Polytechnic University of Madrid, Polytechnic University of Turin, Polytechnic University of Milan, University of Porto...).
The Euro-Mediterranean University of Fes offers many trainings in different fields, within different faculties and institutes.

Engineering:
The university offers trainings in mechanical and renewable energy engineering, environmental engineering and management of water, as well as environmental engineering and climate change, with employment opportunities in the environment sector (renewable energy production, management and treatment of waste, of water…). Students can also study electrical engineering and information and communication systems.
Master in Environmental Engineering:
http://www.ueuromed.org/pro/file/plaquette_master_ge.pdf
Master in Renewable Energies and energy performance:
http://www.ueuromed.org/pro/file/plaquette_master_er.pdf

Political sciences:
The Euromed Institute of political sciences offers trainings in law and political sciences specialized in the Mediterranean area. This Institute was created by the Euro-Mediterranean University of Fes and by the French Paris 1 Panthéon-Sorbonne University. Access to this Institute is selective, open to all nationalities with a high-school degree.

Students entering the fifth year of study have to choose among these five paths:

- *Euro-Mediterranean policy and globalization*
- *Euro-Mediterranean public policies*
- *Euro-Mediterranean local policies*
- *Euro-Mediterranean comparative law*

http://www.ueuromed.org/pro/fr/forma_shs_iespjri.php#cont

Humanities and social sciences Faculty:
This faculty aims to provide students with various skills related to Euro-Mediterranean humanities and social sciences like foreign languages skills, Euro-Mediterranean history, heritage and cultures. Students will gain various skills to better understand the Euro-Mediterranean area, its societies, heritage and history. Classes taught consider relations between Morocco and the Euro-Mediterranean area, and analyze as well relations between the north and the south shores of the Mediterranean Sea.
Here are some trainings related to blue growth in the Mediterranean offered at the faculty:

Bachelor in management of environmental projects and circular economy
This Bachelor aims to provide skills in environmental problems management, to help students develop their analysis of environmental problems and management of environmental resources, with employment opportunities in audit, project management, management of conflicts, conducting innovative environmental projects, use and creation of environmental data… Classes taught are for examples environmental negotiation skills, environment and development economics, environmental law and conventions, renewable energies, environmental issues and public awareness, environmental issues and Euro-Mediterranean culture, systemic studies of waste problems, environmental communication...
http://www.ueuromed.org/pro/file/femshs/Plaquette_Licence_Pro_GESTION_WEB.pdf

Master in management and tourism promotion of EuroMed heritage
This Master aims to train students in local development and economic valuation of cultural and heritage sites located in the Mediterranean region. The Master was created in cooperation with the French Paris 1-Panthéon-Sorbonne University.
Students learn how to analyse management strategies of touristic sites, identification of stakeholders in environmental economy, management of risks in the field of heritage sites and development of tourism, development of conservation and rehabilitation of heritage sites
http://www.ueuromed.org/pro/file/femshs/Flyer_A4_RV_SHS_GVTPE_WEB.pdf

Master students willing to continue their studies can start a PhD thesis within the dedicated Center of the faculty.

1.20 Palestine

Higher Education (HE) in the State of Palestine (SoP) has a relatively short history. Indeed in 1950s a two-year colleges existed but were focused on teacher training, technical education or teaching liberal arts. Only in the 1970s the universities came into existence. They were formed under the Israelian occupation and presented the Palestinian collective effort to preserve the national identity and give the opportunity to young Palestinians to pursue Higher Education.Only after the Oslo Accords of 1994 under the Palestinian National Authority (PNA) the Higher Education Institutions expanded. http://www.reconow.eu/files /fileusers/5140_National-Report-Palestine-RecoNOW.pdf. HE is regulated through the law on Higher Education No 11 of 1998. The law gives the possibility to access to higher education to everyone, it gives legal status to HE and also provides the legal framework for their organization and management. (http://www.reconow.eu/files/fileusers/5140_National-Report-Palestine-RecoNOW.pdf.)

There are four types of Higher Education Institutions: Universities (Al-Jamiaah), University colleges (Al-Kulliah Al-Jamiaaiah), Polytechnics (Al-Polytechnik) and Community colleges (Kulliat Al -Mujtamaah). Each of them offer different professional or technical programs of a minimum of one year's duration leading to diplomas in the respective programs. Now there are 49 Higher Education Institutions located either in the West Banks or in the Gaza Strip (http://www.aqac.mohe.gov.ps/en/home/licensed-hei/), among which 15 are universities, 16 University Colleges and 18 Community Colleges. In term s of governance (management, supervision and funding), there are 4 types of HEIs.

Those public HEI that have been formed after the establishment of the Palestinian National Authority are under the supervision of the Palestinian Ministry of Education and Higher Education and in terms of governance, they are governmental. The United Nations Relief and Works Agency (UNRWA) for the SoP refugees operates one of the largest school systems in the Middle East. Beside the primary and secondary system, the Agency offers university scholarships to qualified refugee youth. Several foundations, charitable societies, religious denominations, individuals and companies finance private institutions. Several universities however set up mostly before the establishment of the Palestinian Authority are in terms of governance public. The majority are non-profit and originally created and owned by local charity associations and NGOs. They depend on fundraising and receive partial government funding. Among all HEI 11 are governmental, 17 are public, 17 private and 4 under the UNRW Agency.

Despite all political problems and Israeli-Palestine conflicts in the last two decades the number of **students/teaching staff** at universities and university colleges increased from **29.380/1.571** in the school year 1994/1995 up to **204.745/6.525** in the school year 2015/2016. The number of graduated students of both sexes increased from **3032** in 1994/1995 to **39672** 2014/2015 and so has increased the ratio of female/male students from **48%** to **61%** in the same period (http://www.pcbs.gov.ps/Portals/_Rainbow/Documents/Education-1994-2015-08E.htm).

Palestine University mostly teach students administrative and financial sciences, medical sciences, arts, dentistry, engineering and information technology, law nursing sciences (Arab American University, Al-Quads University Al-AQSA University, Al Azhar University, Al-Istiglal University), some of them teach only social and political sciences (Birzeit University). While the Faculties of Science offer also the study of biotechnology (the University of Bethlehem, the Islamic Gaza University, Al-Najah National University) and the Institute of Hotel Management and Tourism offers, a master degree in Tourism studies (the University of Betlehem).

1.21 Syria

Insight into higher education in Syria is available from document "The Syrian education system described and compared with the Dutch system" published by the Dutch organisation for internationalisation in education in 2016 (https://www.nuffic.nl/en/publications/find-a-publication/education-system-syria.pdf).

Syria is located in the Middle East and borders Turkey, Iraq, Jordan, Lebanon and Israel. The capital is Damascus, and other major cities include Aleppo, Homs, Hama and Latakia. Syria's strategic and central position in the region means it's a country with a long history. In its current form, Syria was founded after World War I as a French mandate. In 1946 it gained independence from France and from 1958 it became part of the United Arab Republic, along with Egypt. This came to an end with a military coup in 1961, which led to the Ba'ath party taking power in 1963. Syria has been in the grip of a large-scale armed conflict since March 2011. The conflict has developed into a complex civil war with a profound impact on the Syrian people and on the availability of public services, including access to education. It's estimated that between 100,000 and 200,000 Syrian youth have been displaced from higher education since 2011 as a result of the conflict in Syria. Furthermore, Syrian men are three times more likely than women to resume their studies in exile. For example, in the 2016/17 academic year, more than 15,000 Syrians were enrolled at Turkish universities, Source: Statistics website of YÖK (Council of Higher Education).

The Syrian government plays a major role in the supervision and control of education. Primary and secondary education are overseen by the Ministry of Education. Education is compulsory to the age of 15. Higher education comes under the Ministry of Higher Education, with the Council for Higher Education being the coordinating body. The education system is governed by national legislation. Recognised private universities have been authorized to provide education since 2001. Syria does not have a binary higher education system: no strict distinction is made between academic and higher professional education. Some study programmes contain elements of both higher professional education and academic education. The language of education is Arabic. Some graduate level programmes are provided in English or French as well as Arabic. Since the outbreak of violence in Syria in 2011, there's been limited scope for independently researching and verifying any facts, events or circumstances in Syria.

Addresses

Ministry of Education (in Arabic): http://moed.gov.sy/site/Ministry of Higher Education (in Arabic and English): www.mohe.gov.sy

Association of Arab Universities (in Arabic): www.aaru.edu.jo/

Admissions policy for Syrian universities on the website of the Ministry of Higher

Education (in Arabic): http://www.mof.sy/

Cooperation Organisation for Vocational Education, Training and the Labour Market (SBB): www.s-bb.nl

Syrian higher education is provided by universities and higher institutes. Higher education institutions are the responsibility of the Ministry of Higher Education. Syria has both public and private universities.There are currently 7 public universities (Damascus, Aleppo, Tishreen, Al-Baath, Al-Furat, Hama and Syrian Virtual University) and and 20 private universities. Education at public universities is free and is provided in Arabic. The University of Damascus was founded in 1903 and is the oldest and largest university. The Syrian Virtual University is an unusual public university. It was founded in 2002 by the Ministry of Higher Education to offer online education in partnership with international institutions (vocational programmes). Higher institutes are regarded as 'centres of excellence' and are usually directly supervised by public universities or the Ministry of Higher Education. Higher institutes offer degree programmes at the bachelor's, master's and PhD level.

Document points out that there is a very low number of higher education students attending these institutes compared to the total population of the country. The rapid population growth is one of huge challenges facing the country. For instance, the fight to curb the growing unemployment rate, especially amongst young people suggests that education remains one of the government's top priorities in Syria. Over the last decade, Syria has introduced bold reforms to develop a higher quality of education and improve the current infrastructure. Enhancing the standard of living for Syrians through better economic and social conditions is currently one of the government's main objectives.

Several Universities in Syria offer high education programs related to Blue Growth including Higher Institute for Water Management, Higher Institute for Sea Research and Higher Institute for Environmental Research at Tishreen University. However, overall information in English language is limited and it is hard to fully evaluate education programs related to Blue Growth potential.

1.22 Tunisia

a) *Introduction and national context*

In the second quarter of 2017, 15.3% of the total population was unemployed[58]. Unemployment concerns also graduated from higher education. This is especially this part of the Tunisian population, young and highly skilled, who started the Jasmin revolution in 2011, demanding social justice and a fair access to the job market. One of the demands of the participants to the demonstrations was a better access to jobs and a better future and opportunities, in this country of massive unemployment, especially among young people (three times more among the people aged 18-29). Many graduated young people are unemployed or overqualified for the job they have[59].

Tunisia has 11.3 million inhabitants[60]. Among them, 1 728 900 are unemployed (12.4% of the men, 22.7% of the women). Among unemployed people in 2017, 259 700 i.e. 15% are graduated from the higher education.

Here are the following numbers of graduated in different academic fields:
61 400 are graduated of high technician
38 700 are graduated in social sciences
41 600 are graduated in law, economics or management
71 700 are graduated in exact sciences
46 300 have another degree of the higher education[61].

Tunisia has 250 higher education institutions; among them 55 are private institutions, 19 are preparatory schools, 17 engineering schools and 9 higher institutes delivering engineering degrees; and one Normal Higher school (École Normale Supérieure). The number of students doubled between 2002 and 2012. In 2012, 31% of relevant age group was enrolled in a higher education training [62]. In 2014, students could choose to study one of the 584 Bachelor trainings (including 392 professional trainings) and one of the 489 Master trainings (including 223 professional trainings)[63]. In 2013, 5% of Tunisian State's operating budget was allocated to development of higher education[64].

b) *Sample of available trainings in the blue growth area*

The ISSTE (Institut supérieur des Sciences et Technologies de l'Environnement de Borj Cédria-Higher Institute of Sciences and Technologies of the Environment of Borj Cédria) offers various trainings related to the protection of the environment:
Bachelor in physics and chemistry, with a major in chemistry and environment

[58] http://www.ins.nat.tn/fr/themes/emploi
[59] http://www.lemonde.fr/afrique/article/2011/01/07/le-chomage-des-diplomes-moteur-de-la-revolte-tunisienne_1462244_3212.html
[60] http://www.ins.nat.tn/fr/themes/population
[61] http://www.ins.nat.tn/fr/themes/emploi
[62] http://www.diplomatie.gouv.fr/IMG/pdf/fiche-curie-enseignement_superieur_maroc_cle41f18d.pdf
[63] http://www.diplomatie.gouv.fr/IMG/pdf/TUNISIE_fiche_Curie_septembre_2014__cle01249a.pdf
[64] http://www.diplomatie.gouv.fr/IMG/pdf/TUNISIE_fiche_Curie_septembre_2014__cle01249a.pdf

Bachelor in Life Sciences: Life Sciences and Environment
Bachelor in energies and environment
Bachelor in protection of the environment
Master in Solar energy
Master in Integrated Safety-Quality-Environment Management within companies
Master in Engineering in Life sciences and environment
Master in Engineering in Water treatment
http://www.isste.rnu.tn/

The Bizerte Faculty of Sciences of Carthage University offers a Bachelor in protection of the environment, aiming to train future professionals of the environment. Students will be developing skills and knowledge about ecosystems and biodiversity, protection of natural resources, identification of pollution, water and waste treatment…
http://www.fsb.rnu.tn/Fr/protection-de-leenvironnement_11_505

The Faculty of Sciences of Tunis University is offering a Bachelor degree in protection of the environment, bioresources and sustainable development. One of the classes concerns the role, benefit and value of mycological and algal bioresources.
http://www.fst.rnu.tn/fr/PDF/PRG_LMD/Licence/Licence_L3_PDF/LAPE3_BD.pdf

c) Case study : the INSTM

The INSTM (Institut National des Sciences et Technologies de la Mer-National Institute of Sea Sciences and Technologies) is a research center with the following tasks:

- To conduct research related to the sea environment: fishery, sea technologies, sea sciences, etc.
- To participate to national, regional and international networks in the field of sea
- To solve the environmental problems in the sea or the coasts
- To produce knowledge and to inform all stakeholders involved in marine activities
- To enhance sustainable management of the sea and its resources
- To inform citizens about sea and biodiversity protection.

http://www.instm.agrinet.tn/index.php/fr/

The INSTM also provides supervision of internships and thesis for students enrolled in Master or PhD, in order to prepare them to enter the job market. Students and teachers are spread into different laboratories:

The laboratory of fishery sciences is working on living marine resources, biology, stock assessment (shellfish, fish etc.), biomass, fishing techniques, behavior in captivity… The laboratory published hundreds of national and international scientific publications every year, and has many cooperations with national universities and international research centers (including France, Morocco, Spain, Italy…). Among the staff, six teachers and 21 teaching assistants are working in this laboratory. Five persons are currently preparing their habilitation, while 13 are enrolled in a PhD curriculum. Two Master students are participating to the activities of the laboratory.

35 researchers and technicians and 25 Master or PhD students are working within the aquaculture laboratory.

The laboratory of biodiversity and marine biotechnologies is working on biodiversity and marine ecosystems, protected species and invasive species, biotech farms of micro and macroalgae, quality of fishery products, aquatic animal health… Among the staff, seven are teachers and 15 are teaching assistants. One Master student and 11 PhD students are contributing to the activities of the laboratory. Nine people are preparing their habilitation.

The laboratory of blue biotechnologies and aquatic bioproducts is working on three main topics, which are quality of aquaculture products, development of processing processes and bio-preservation of aquatic products, and biotechnological processes for a blue economy. Six teachers are teaching in this laboratory and 15 PhD students are enrolled. A Master in blue biotechnologies was created in 2014 in this laboratory. 13 master students are currently enrolled.

1.23 Turkey

Insight into higher education in Turkey is available from document of World Education news and Reviews (https://wenr.wes.org/2017/04/education-in-turkey). With respect to education, barriers for growth have been identified in the EUNETMAR document (https://webgate.ec.europa.eu/maritimeforum/sites/maritimeforum/files/Turkey_annex.pdf).

Surrounded with seas in its three sides, Turkey has specific location with its lakes, dams, rivers and spring waters. Total area covered with usable water is approximately 26 million hectares along with seas remaining within continental shelf. About 95% of this area consists of sea (24,607,200 ha), whereas 1.3% is dam lakes (342,377 ha), 3.5% is natural lakes (906,118 ha) and approximately 0.1% consist of lakes (15,500 ha). In addition, Turkey has a river network of 178,000 km in length and the Europe's longest coastal line with an approximate length of 8 300 km. All these facts placed Turkey at high position regarding potential in research and initiative for blue jobs and growth in the Mediterranean.

The Turkish economy has achieved an outstanding performance with its steady growth over the last 15 years. Sound macroeconomic strategies, prudent fiscal and monetary policies, structural reforms pursued throughout this timeframe resulted in high rates of growth and increased confidence in the Turkish economy. According to the World Economic Outlook Report of the World Bank issued in April 2017, on the basis of the purchasing power parity (PPP), Turkish economy is the 13th largest in the world and 5th largest in Europe in 2016. Turkey has taken the first place among the OECD, EU and G20 countries according to the economic growth rate in the first three quarters of 2017.Overall economic growth rate for 2017 is expected to be around 6,5 – 7 %. With regard to the estimates of OECD, Turkey will be one of the fastest growing economies in the period of 2015-2025 with the average annual growth rate of 4.9 % (source: http://www.mfa.gov.tr/prospects-and-recent-developments-in-the-turkish-economy.en.mfa).

The enormous growth, or better, the delayed massification in the Turkish higher education institutions after 2006 has facilitated access to and increased supply in higher education. Today, the number of higher education students in Turkey is over 7 million. In conjunction with Turkey's growth in higher education, economic development, and international recognition, a remarkable increase in the number of international students and faculty members in the country can be seen. The Bologna Process, in particular, with its student and faculty exchange programs, has made significant contributions to the internationalization experiences of higher education institutions, and public universities, in particular, have engaged in competition with each other. In this regard, Turkish higher education institutions have expended tremendous efforts and witnessed notable success. Also, the number of international students in Turkey has been on the rise. According to data from the last 10 years, the number of international students remained level at about 15,000 until 2008. It dramatically increased when the Council of Higher Education (YÖK) actively took charge of the process and introduced regulations in procedures and implementations, and the uptrend continues.

There are 183 universities and academies in total: 109 state universities (eight technical universities, one institutes of technology, and one fine arts university), 65 private foundation universities, six two-year granting institutions, one special national defense university, and one police academy. Turkey has facilitated access to higher education for its own citizens and on the other hand, it has undertaken a number of projects for the purpose of becoming an important international hub in the international higher education network. PhD programs are the education programs that have the most significant and numerous effects. Quality and quantity problems in doctoral degree programs may negatively affect many areas involving research and development activities. Turkey, which has emerged as a leading political actor with a strong economy both regionally and globally, and whose higher education system has recently undergone a positive process of transformation, has the potential to take significant part in research and innovation initiative for blue jobs and blue growth in the Mediterranean area. Turkey needs to develop urgent policies to turn this new global political situation in its favor, more than ever before.

Educational units related to blue jobs and blue growth are numerous. The highest importance is directed to maritime education since this sector have the highest potential for growth.

Tourism: Turkey is the 6th most popular tourist destination in the world (2015), attracting more than 30 million tourists annually and continuing to show positive growth year-on-year. The tourism sector has set a target of 50 million tourist arrivals and of USD 50 billion tourism revenues by 2023. 30.9 million tourists visited Turkey in 2016 and provided approximately 18.7 billion USD input to the economy. In tourism sector there has been an increase of 29 % in the number of the foreign tourists in 2017. Turkish tourism sector is targeting to be among the top 5 countries in the world in terms of attracting the highest number of tourists and receiving the highest amount of tourism revenue by 2023.

In tourism and coastal tourism particularly Turkey have well-trained workface and at several universities tourism and hotel management programs (Yasar University

Turkey, Izmir: https://apply.yasar.edu.tr ; Akdeniz University Faculty of Tourism Antalya, Turkey: www.mastersportal.eu/universities/15438/akdeniz-university.html ; Near East University, School of Tourism and Hotel Management, Mersin, Turkey: www.mastersportal.eu/universities/9264/near-east-university.html; Cyprus International University, Tourism and Hotel Management: www.mastersportal.eu/universities/16389/cyprus-international-university.html,....
However, institutions offering vocational education need capacity reinforcement with improvements in quality and content of their curricula. Also, Turkey have to raise awareness on existence and protection of national tourism assets and resources.

Fisheries: Fisheries being one of the four sub-sectors of the agricultural sector of Turkey, it has a vital importance in contributing beneficial nutrition for human beings, providing raw material for the industrial sector, creating the employment possibilities and high potential for export. Marine capture fisheries have an important share in the total fisheries production as the country is bounded by four seas: the Mediterranean to the south, the Aegean to the west, the Sea of Marmara between the European and Asian landmasses, and the Black Sea to the north. However, it is not easy to say that the fisheries sector, with a share of 0.3% in GNP (Gross National Product) and 2.7%

in the agricultural sector, has played its expected role in agriculture and national economy (source: https://www.oecd.org/turkey/34431494.pdf)

Aquaculture: Turkey is one of the leading countries in aquaculture sector and shall reinforce its position thanks to the increase in production rates. However, many unfavorable situations are experienced by aquaculture sector, which contributes to the country's economy and has great export figures among foods of animal origin. Discussions between water products farmers and consortium of environmentalist and tourism professionals have been come to the fore and defamations directed towards aquaculture have put the sector into a hole officially and created negative impacts on public's point of views about farming. Although increase in aquaculture is available, amount of fish consumed per capita annually has not shown any increase. Such a confliction arises due to significant change in region based consumption level of water products and lack of consumption habits. Demand matters experienced in domestic market have made aquaculture sector depend on foreign countries. Water products to be supplied and production planning is related with demand of foreign countries, in particular European countries. Due to its foreign market oriented structure, sector does not have stable production figures. Turkey has a strong position in terms of its water resources. Rehabilitation efforts should be given to enable best usage of this potential and to protect these resources for long years, potential areas where aquaculture can be performed should be identified and carriage capacity of water resources over which farming is performed should be determined. Aquaculture sector shall overcome social, ecological and economic problems along with research studies and environment-friendly cultivation practices.

Regarding fisheries, 13 fisheries faculties (Aegean University, Faculty of Fisheries: http://egefish.ege.edu.tr/; Ataturk University, Faculty of Fisheries, Department of Aquaculture, Erzurum, Turkey: www.atauni.edu.tr, Ege University Fisheries Faculty: www.egefish.ege.edu.tr/en/departments/aquaculture-department; Faculty of Marine Sciences of Karadeniz Technical University: www.deniz.ktu.edu.tr/indexe.htm) and 5 departments at agriculture faculties providing undergraduate and graduate education in fisheries including aquaculture exist in Turkey. However, unavailability of experienced labour (cheap labour highly available when experience is unnecessary) is lacking.

Maritime industry: The maritime sector plays a strategic role in Turkey's economic development plans. The Turkish maritime industry offers immense opportunities to boost the country's trade ties with its neighbors. Of the total goods transported into and out of the country, 85% go through Turkey's 71 ports. In 2015, a total of 302 million tons of goods were transported in and out of Turkey by sea, of which 209 million tons were imports and 93 million tons exports. The maritime sector represents an important source of employment in Turkey. According to a report by the EU Commission, the sector provides around 300,000 jobs and produces a total Gross Value Added (GVA) of more than EUR 4 billion representing 82% of the jobs and 74% of the total GVA generated by the sector. In recent years, the Turkish government has increased its investment in the maritime sector in order to boost its competitiveness.

The shipbuilding, ship breaking and recycling industry is one of the fastest growing in Turkey. Today, Turkey has 87 modern quality-certified shipyards that can build ships, mega-yachts and sailing boats as well as carry out extensive repair and conversion works. Izmir's Aliaga region is the main hub for the country's ship breaking and recycling facilities. Turkey is currently the fourth biggest country in the world for ship breaking

and recycling, after India, Bangladesh and China. Turkish shipbreaking yards recycled about 1 million tons of steel in 2015. It is estimated that the ship breaking and recycling industry provides 10,000 jobs in Turkey.

Turkey has been developing its existing ports. Turkey has launched several large-scale projects to increase its port capacity and meet the needs of rapidly increasing freight transportation. This increase in capacity is expected to strengthen Turkey's position on the global stage. The main developments in this sector are the privatization of state-owned ports, large foreign investments in port expansion, and more joint ventures between private Turkish ports and foreign port operators in Europe, the Middle East, and Asia. A new container terminal in the city of Kocaeli currently employs 300 people and would create more than 650 direct permanent jobs and a minimum of additional 800 jobs indirectly when its full capacity is reached. Turkey is also building a new port in Izmir, called Candarli port. When completed, it will be the biggest port in Europe and the 10th biggest in the world. The port will have a capacity of 12 million TEU. The port will have a total berth length of 2,000 meters and its yard width will be 1,000 meters. Six 300-meter long ships will be able to approach and draw near the port at the same time.

Turkey has gained wide international recognition for its expertise in mega-yacht building in recent years. Turkey's mega-yacht building sector has been growing at a rate of 20% annually over the past years. Turkey's yacht building sector was valued at over $5.5 billion in 2015. The country's competitive labor force is a major advantage for its boatbuilding industry, as labor costs are lower compared to other European countries and the USA.

Turkish authorities consider the development of marinas as vital to ensuring Turkey's ability to compete with other Mediterranean destinations such as Italy and France. There are currently 62 marinas and 75,000 boats in Turkey according to the Turkish Maritime Authority. Turkey's current marina capacity is 17,500. Given the huge volume of maritime traffic in the Mediterranean (some 1 million boats travelling annually), increasing the capacity of marinas is crucial for Turkey. The Ministry of Transport and Maritime Affairs is planning to develop a number of marinas and foresees a doubling of the number of mooring berths by 2023.

Big efforts have been made in the last years to transform existing cruise ports in recreational areas and to establish a platform that brings together institutions and companies interested in cruise tourism. Twenty-one Turkish ports received cruise ships in 2012. According to the Tourism Master Plan issued in 2011, seven new cruise ports will have been built by 2023. The number of cruise passengers landing in Turkish ports grew over the last years from 1.3 million in 2006 to 2 million in 2012, and is expected to keep on increasing in the years to come (source: https://investingroup.org/snapshot/273/blue-growth-maritime-industry-in-turkey-turkey/).

There are 4 universities with shipbuilding departments (ITU Faculty of Naval Architecture and Ocean Engineering: http://www.itu.edu.tr ; YT University Naval Architecture and Marine Engineering: http://www.gidf.yildiz.edu.tr/; Istanbul Technical University (ITU) - Shipbuilding and Merchant Marine Programs: www.edumaritime.net/turkey/istanbul-technical-university-itu; NEU Faculty of Maritime Studies: www. old.neu.edu.tr ,…). Piri Reis University is recently established in Tuzla, but they don't have enough training vessels, exchange between universities of other major shipbuilding counties are limited.

There is vast network of faculties on maritime studies and maritime high schools. However, there are limited dedicated cruise programs at higher level of education and lack of maritime officers.

2. Present common practices for training and capacity building

This document provides information on practices for training and capacity building in Mediterranean countries. Although **availability of data varies** between countries, certain patterns are clearly evident.

High education in most countries is based on a three study cycle **Bologna Process**. The first-cycle features professional and academic undergraduate study programs; the second-cycle features postgraduate master's study programs (second cycle or integrated), and the third-cycle postgraduate doctoral study programs. In certain countries (e.g. Croatia, Malta, Slovenia), high education is still quite centralized, although efforts are being made to change this.

Overall, there are **numerous education programs** many of which are developed as a part of the implementation of Bologna Process. For example, there are 995 University programs currently accredited in the Republic of Slovenia and 1148 in the Republic of Croatia. Similar situation is also in other countries covered by this document. Due to this large number, it is very difficult to assess them in relation to Blue Growth.

Besides opening of numerous new study programs at public institution, since 2000s education is characterized by **mushrooming of private higher education** institutions. There is a certain level of concern that rapid rise in number of programs offered is not supported by adequate levels of teaching and research capacities and that efforts should be made in **strengthening and improving** them with special attention to **interdisciplinarity** and **need for excellence**. Mediterranean counties are exposed to rapidly changing economic environment and frameworks for environmental sustainability and, to facilitate Blue Growth, training and capacity building programs need to be capable for adequately responding to them.

Variations exit in **understanding of current job markets** and demands for training and education. Thus, there is a need for systematic study of training and education options at national levels. **Lifelong learning** is highly variable between Mediterranean countries. For example, in Croatia it is only 3%, while in France it is 18% (EU 11%). There appears to be a strong need to develop lifelong learning related to Blue Growth issues. Due to existing language barriers, especially in mid to late career workers, there are limitations to international cooperation in lifelong learning. Yet, there is certainly potential for providing the international training to teachers involved in this process and sharing of good practices between France and other countries.

Erasmus Mundus Joint Master Degrees are great examples of international cooperation programs in higher education and are often innovative, inter- and multi-disciplinary, and skills oriented. They should be supported further in areas related to Blue Growth. Examples include International Master of Science in Marine Biological resources, Erasmus Mundus Joint Masters Degree in Water and Coastal Management, European Masters in Tourism Management, and Erasmus Mundus Master course on Maritime Spatial Planning.

Further on, example of **international collaboration** includes establishment of Euro-Mediterranean University with headquarters in Slovenia that offers programs and

courses related to Blue Growth issues. Another positive example of international collaboration is establishment of Blue Career Center in Cyprus, with representation from Greece, Bulgaria and Romania, and observers from Egypt, Jordan, Lebanon and Turkey. These programs should be further advertised and be made accessible to students from different countries to promote international mobility and capacity building in Mediterranean countries.

Strong **bilateral cooperations** are established in relation to Blue Growth issues between universities and research centres in different countries, such as for example between Albania and Italy, as well as between Algeria and France and Italy.

It is important to note that, although teaching is manly conducted in native language of the country, there are programs and trainings that are taught almost entirely in English in many Mediterranean countries. For example, in Spain, the *Institute of Sustainable Tourism and Economic Development*, TIDES, which belongs to the University of Las Palmas de Gran Canaria (ULPGC), launched in 2013-2014 a Master degree in tourism, transport and environmental economics, that is entirely taught in English.

There is high potential for creation of **online courses** identified in several countries that needs to be explored in the future. Additionally, short programs, such as **summer schools**, could provide a great framework for creation of joint programs and staff/student exchange.

In the framework of the First Union for the **Mediterranean Stakeholders Conference** on the Blue Economy, held in Naples Italy in November 2017, the workshop on "Blue mission in the Mediterranean region: promoting youth employability throughout developing skills and building capacities in the marine and maritime sectors" has been organized, in line with the efforts by the Union for the Mediterranean on enhancing skills and higher education (http://ufmsecretariat.org/higher-education-research/). According to conclusions from this meeting, there are „excellent individual initiatives that offer the opportunity of building capacities, job-oriented training supporting career development in the sector of Blue Growth both on the northern and southern side of the Mediterranean. Such initiatives, demonstrate that talents exist, it is crucial to move from individual capacity building to institutional capacity by involving institutions and key persons". Further on, it was concluded that there is a need for establishing a **Pan-Mediterranean network** implemented though web portal that could provide coordination of opportunity offers for developing skills and building capacities of the young generation in the marine and maritime sectors. The experience of the Mediterranean University Union (UNIMED, http://www.uni-med.net/en/) could be taken into account in this process.

3. Linking human resources practices to BLUEMED platforms

3.1 Knowledge

Higher education and research related to Mediterranean has a **long term tradition** in many countries. Due to the number of languages and cultures in this region, communication between different countries has been a challenge in past times. Spread of acceptance of English language for communication in science and financing of projects by European Union over passed decades facilitated communication between different research groups and countries and resulted in establishment of different formal and informal **networks**. This has in term contributed to **scientific excellence** and exchange of ideas, although there are still great possibilities for integration and collaboration.

At national levels, certain countries put a great effort to **integrate expertise** related to research of marine environment and offer students wider possibilities for education and training. In 2010, total of 15 French universities that specialize in marine sciences gathered into organization called Marine Universities. Furthermore, French research institutions formed the Mediterranean Institute of Oceanography in 2012. Similar situation is in Italy, with Universities joined in the National Inter-University Consortium for Marine Sciences (CONISMA). Opposite situation was found in some other countries, including Malta and Croatia, where **lack of synergies and cooperation** between institutions has been identified.

Besides initial trainings, certain universities are also organizing **workshops and summer schools** about Blue Growth issues. These growing activities are demonstrating the importance and the awareness about Blue Growth issues.

Overall, it appears that institutions, professors and researchers working in the Mediterranean region have very good **capabilities** to address issues related to Blue Growth. Challenges are related to their **capacities** to complete all task related to continuously increasing workload, both in terms of expectations related to scientific productivity, professional work as well as administrative assignments.

It is important to note that there are challenges related to recruitment of young researchers. **Doctoral and postdoctoral positions are quite limited** in the Mediterranean region, as well as research funds available to these students, so many young promising scientists are moving to northern parts of Europe or other parts of the world. This needs to be addressed and attempts should be made to secure funds at national, European and Mediterranean level to enable keeping of most promising scientists in the region as well as to enable return of those that already left. Number of available scholarships, fellowships and grants needs to be increased.

There is a need for establishing **better communication** channels between scientific community and other **stakeholders** including those in economy, technology and policy. Although Horizon 2020 strongly supports applied science projects, there is still great place for the progress.

3.2 Economy

As many as they are, the main marine or coastal economic activities have gone through significant changes in the last decades and the evolution will continue.

Sea shipping relates to all the Mediterranean countries and for many of them is of vital importance. Essentially, all aspects of international shipping are however covered by the measures prepared by IMO (International Maritime Organisation) and almost all of the Mediterranean countries are IMO members. A step forwards are the IMO conventions relating prevention of marine pollution that entered into force in the last two decades, but, because a rigid and worldwide orientation of IMO, a relatively more regional approach of the Mediterranean countries is welcome especially in environmentally sound, energy efficient and secure approach. Formation of maritime clusters, either state controlled or port controlled, could contribute to a cooperation that is more efficient, through networking and integration between various players (shipping agents, cruise lines and offshore companies, e.g.). Since there are some EU financial instruments available for cluster formation, it should be considered as a good opportunity.

Coastal, nautical and cruise tourism are in constant rise for the last three decades and they represent a growing pressure on regional and local land and marine ecosystems. This is truth for the most of the Mediterranean. It is essentially season-oriented activity, with its maximum in late spring, summer and early autumn. It presents an important pressure on local environment, water resources and the waste disposal. The strategic approach should be oriented toward a more sustainable tourism, where local communities and SME will be involved in introducing innovative technologies and minimizing the pressure on the local environment (Traceability and security of good supply chains, securing fresh water supply – desalination – where applicable).

Fisheries and aquaculture are two activities of essential importance for the majority of Mediterranean countries, although in some of them freshwater aquaculture is economically of greater importance than marine. Fishery is very likely to be subject of a decrease in the next decade in terms of human power employed and as well as in terms of fish catch due to overfishing in the last decades. Therefore, the existing fish processing industry should concentrate towards reduction of a relatively high quantity of discards and make their better usage (e.g. cosmetics made from enzymes from inner organs, fish skin transformed to leather and medical device, liver oil and intestine fish oil where applicable). The aquaculture has however promising future as it will have to fulfill the gap caused by lowering in fish catch. Aquaponics is an interesting activity for the Mediterranean area, yet it should be properly assessed. There are cases of marine clusters in Europe where several tens of partners cooperate in order to increase the value of the cluster by connecting people and business, improve performance and competiveness and eventually create new jobs. Activities like **Fisheries and fish processing, Aquaculture, Biotechnology, R&D education and training, Ocean tourism, Finance and services, Marketing and distribution** and others make a part of the same cluster. Can this become a model for Mediterranean as well?

Protection of habitats and preservation of biodiversity is actually not an economic activity as such; the positive trend simply reflects an increase in the level of public expenditure for the protection of habitats. Nonetheless, this increase indicates that there

is better awareness of environmental protection and sustainable development. **Maritime Spatial Planning and Coastal Zone Management** should contribute to the protection and conservation of biodiversity in the first place.

3.3 Technology

Without doubt, higher education and research related to Mediterranean has a long term tradition in many countries within Mediterranean basin with some of the oldest universities in the world. However, integrating technology in the existing curricula of majorities of high schools and universities is a very **complex task** and its implementation is at different stages in different countries and faces numerous obstacles. Some of the benefits of using technology in education can include easy access to academic information, ability to learn easily, ability to learn from anywhere and ability for fast inclusion on the labor market after completion of education. Moreover, it is necessary for creating educated people who will be able to take over jobs that involve working with cutting-edge modern technology.

As the world develops, more technological jobs will appear; current students have to be prepared for this **new era of tech demanding jobs**. Most of the jobs we have today will not be worth in 5 – 10 years, technology will have presented us with new opportunities which will be more rewarding than the present jobs. So completed educational processes without using new technology are denying these students the chance to compete tomorrow for new jobs.

The **lack of professional development and support** has acted as a barrier to the effective use of technology in education to a great extent. In many cases, teachers feel unprepared to learn and integrate technology in the education process. There is a **lack of training programs** on ways how teachers can use technology to simplify their job and also make it easier for their students to learn better. So, if teachers have no training skills on using technology for educational purpose, then students will also miss out on these skills. This is a common practice in public schools and universities where **the lack of technological tools** (smart whiteboards, projectors, computers, access to internet, modern school vessels equipped with modern technology, navigation and fisheries simulators, automated devices, robotics, …) is evident, while private educational units are business entities which are operated on competitive advantage, so they emphasize the use of modern technology in the class and laboratories and their teachers are well trained and well equipped with technological tools for education. Further on, private high schools and universities due their tight connection with business usually provide for students **more practice work**, both in term of quality and quantity, enabling students after completing such programs to have adopted skills and gaining experience that making them prepared to start working immediately in a highly technological encirclement as opposite to students from public schools. Moreover, **unavailability of experienced labour** is stated as one of main barrier for progress in many sectors related to new blue jobs and growth. In the same time, cheap labour are highly available within all Mediterranean countries when experience and education is unnecessary.

Another barrier of using technology in education is **resistance to change**. Using technology in the classroom can be so time demanding during the first phase of

introduction. So, there are many excuses for not using it, including not having enough computers, not getting enough technical training, the process of learning technology and its integration in education is time consuming, fear that technology might replace humans, etc. Also, using technological tools requires a certain degree of creativity. The most challenging thing about technology is that requests constant, lifelong learning how it works and how to use it since technological tools are designed to be multitasking.

There is a high need for establishing better relationships between universities, scientific community and business sector in term that students **get in touch with modern technology from the very first day of their education** through research and development projects and practice work in real technological environment. On the other sides, states need to find political will for finding stable multiannual financial sources (national budget and international infrastructural projects) and competent human resources for faster and better implementation of technology into educational units through acquisition of technological tools for educational units and insurance of training programs for teachers and students, including also long-life programs of education enabling professional development and support.

3.4 Policy

In last 30 years a number of policies relevant for BLUEMED were developed and implemented. Policies are extremely important for BLUEMED due high need for a policy perspective addressing SRIA actions. It is **essential to identify and underline the support to EU, national and regional policies** that can be referred to the different SRIA actions, and therefore to the BLUEMED. Moreover, policies are an essential component of the landscape promoting the conditions for the deployment of SRIA actions. Policies and strategies are in BLUEMED divided for convenience in four categories: (1) Strategic EU Blue Frame, (2) Regional Cooperation, (3) Sectoral Policies and (4) Directives and other Regulatory Acts. Detailed list of policies and links per each categories can be found at http://www.bluemed-initiative.eu/policy-strategy. For sure, the list is by definition incomplete and continuously evolving.

As stated earlier, institutions, professors and researchers working in the Mediterranean region have very good capabilities to address issues related to Blue Growth. However, beside all challenges related to scientific productivity and professional work together with administrative assignments, they also have to continually **follow news related to policy making and different policies implementation**. Unfortunately, if they come from natural or economic sciences, they usually don't have enough competence for this task. Even, at highest educational degree, like multidisciplinary doctoral studies in the region, courses related to recent sectoral policies are rare.

Although initially relatively simple as a concept – the inclusion of policy in educational process or new investments for particular activities related to BLUEMED in order to strengthen comparative advantage in the region – the **conceptual and policy implications of Smart Specialization Strategies are far more complex**. It underlies role of scientific, technological and economic specialization in driving economic growth; policy intelligence for identifying domains of present or future comparative advantage; and governance arrangements that give a pivotal role to regions, private stakeholders

and entrepreneurs in the process of translating specialization strategies into economic and social outcomes.

In relation to skills, it is worth mentioning the effort by the European Commission DG-MARE in coordinating the actions related to the maritime technology sector as part of the Blueprint for Sectoral Cooperation on Skills of the New Skills Agenda (https://ec.europa.eu/maritimeaffairs/content/new-skills-agenda-blueprint-sectoral-cooperation-skills_en), and in launching dedicated calls for blue careers (e.g. https://ec.europa.eu/easme/en/call-proposals-blue-careers-europe).

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