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HIGHER EDUCATION FOCUSED ON PORT MANAGEMENT IN EUROPE

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Abstract

EU directives on environmental sustainability, such as *Directive (EU) 2019/883* of the *European Parliament* and of the *Council* of 17th April 2019 on *port reception facilities for the delivery of ship-generated waste*, are stringent. The *Commission Communication* of 05/23/2013 (*Ports: a driver for growth*) states that "*Port activities cause significant impacts in terms of emissions, noise, water and soil pollution as well as habitat fragmentation*" and "*The Commission welcomes the initiatives taken by the port sector to promote excellence in environmental management and performance through the publication of guides to good practice*". Ports therefore need to adapt to the new requirements also, and above all, in terms of stricter requirements for environmental performance and alternative fuels. Furthermore, according to the European Commissioner for Transport "*Maritime transport is a global business, and reducing its emissions requires global solutions. The entry into force of the global sulphur cap is an important milestone for the entire maritime sector; it will contribute to further reduce emissions of harmful air pollutants, directly benefiting cities and communities around the globe, including important ones on our Southern European shores. It also shows that concerted effort from the EU and the IMO, together with strong commitment from the industry can deliver important benefits to the environment and the health of our citizens*".

Therefore, due to Europe's historical relationship with the sea (mainly due to commercial reasons) a study has been undertaken on the current offer of European Masters related to seaports. This offer has been analysed according to the educational areas taught (legal, operational, business, management, safety, engineering, ecological, etc.), the language in which they are offered, the duration of the studies, the location of these masters by country and the type of teaching (in person or online). The results have been shown in graphs and it has been seen, among other aspects, that the countries of Southern Europe are the ones that contribute most to teachings related to the maritime sector.

Keywords: carbon neutral, port, emissions, innovation, education.

1 INTRODUCTION

Carbon neutral is a term used to describe carbon-based fuels that when burned will not increase carbon dioxide (CO₂) in the atmosphere (Christine Gable; Scott Gable, 2020).

Shipping is the most efficient means of transport in the use of energy. Nevertheless, the CO₂ emissions from maritime transport are significant, being around 4% (Carlier, 2011). Thus, the need to promote sustainable maritime transportation has been increased over the years. Especially from 2008, due to the Global Economic Crisis, which highlighted the dependence of the maritime sector on the use of oil for its operation (UNCTAD, 2018). Another aspect to consider is the use of energy when the ship is berthed in the dock, since the pollution directly affects the population of port-cities. Thus, the connection of vessels to the electricity grids prevents high concentrations of these pollutants from exceeding the limit values. The World Health Organization, in its *WHO Air quality guidelines* (WHO, 2005) has established the maximum exposure values for the port-cities as following: Particulate matter (PM_{2.5}) 10 µg/m³ annual mean; Particulate matter (PM₁₀) 20 µg/m³ annual mean; Nitrogen dioxide (NO₂) 40 µg/m³ annual mean and Sulphur dioxide (SO₂) 40 µg/m³ 24-hour mean.

The biggest source of marine pollution by hydrocarbons is coming from natural releases and are about 49% (Fig. 1). The phenomenon is partly observed in areas of high seismic activity, such as the Gulf of Mexico, the Mediterranean Sea and the coast of Alaska. Maritime transport, including the transportation of hydrocarbons, port activities and off-shore operations account for 47% of pollution by hydrocarbons. "Small craft" under 24 meters of length, are responsible for 4% of sea-based oil pollution. However, within the small craft category, it is difficult to distinguish recreational craft from small fishing boats or commercial vessels (Moreau, 2009).

The International Maritime Organization (IMO) is an agency of the United Nations that sets the standards for the safety, security and environmental performance of international shipping. IMO has adopted regulations to address the emission of air pollutants from ships and has adopted mandatory energy-efficiency measures to reduce emissions of greenhouse gases from international shipping, under the Agreement MARPOL (IMO, 1998). In recent years, discussions at the International Maritime Organization (IMO) have resulted in the development of an Energy Efficiency Design Index (EEDI) that led to the adoption in 2011 of legally-binding energy efficiency standards applicable to newly-built ships. The standards apply to ships built in 2013 and later and require all future ships to meet increasingly stringent fuel economy standards over time. The EEDI (Energy Efficiency Design Index) represents a measure of the relative efficiency of a vessel by establishing an index to measure the inherent design efficiency of a given vessel in moving a given cargo volume over a given distance. The IMO agreed in October 2016 to develop a comprehensive strategy for addressing GHG emissions from international shipping. The strategy will consider different actions that can be pursued to reduce GHG emissions from shipping over the short, medium, and long term. An initial GHG reduction strategy is expected to be agreed in 2018 with subsequent review and revision through 2023 using ship specific data generated by IMO's recently adopted data collection system. The IMO data system will collect in-use fuel consumption data from ships with annual reporting that will allow governments and other stakeholders to accurately assess fuel consumption and emissions generated by international shipping.

In the particular case of Spain, current practices for the carbon neutral sport marinas management industry have been running, such as:

- OPS Master Plan for Spanish Ports

The OPS Master Plan for Spanish Ports projects aims at drafting a Master Plan for the supply of electric power to ships at berth in Spanish Ports. The OPS Master Plan for Spanish Ports project is part of the National Action Framework for the development of infrastructures for the use of alternative fuels in the transport sector, in compliance with Article 13 of Directive 2014/94 EU. During the three years execution of this Project, pilot cases will be carried out, by including the provision of electrical equipment in piers and ports of general interest, as well as the adaptation of the ships that dock there. In addition, the project will allow the realization of a series of technical studies to identify the barriers that exist today for the implementation of this new and environmentally green technology.

- CORE LNGas hive

The aim of the project is to develop a safe, efficient and integrated logistic chain for the supply of LNG (Liquified Natural Gas) as a fuel for the maritime sector in the Iberian Peninsula. It will foster the use of this alternative fuel not only in vessels but also in the port environment. LNG is one of the most environmentally friendly fuels. It helps the decarbonisation process of the European economy and allows for the reduction of our dependence on traditional fuels. Moreover, it eliminates emissions of sulphur oxides (SO₂), particulate matter (PM) and reduces drastically nitrogen oxides (NO₂), which will facilitate complying with increasingly tight environmental regulations in the maritime sector.

2 METHODOLOGY

The *European Union* is highly dependent on seaports for trade and tourism flows both within and outside the Union. However, investment policies are needed to adapt the existing port infrastructure to the new logistical and transport requirements and to absorb the short-term growth targets for freight traffic. In a hot period of climate change, it is necessary to reassess the approach to the main processes from a sustainable point of view, including in the port area. The *European Union* has recently highlighted how port policy must, in fact, guarantee stability and protection of the environment and the health of citizens. Although maritime transport is still considered one of the most ecological, it

is still necessary to reduce polluting emissions with suitable practices, from the use of fuels to the management of waste or wastewater.

An analysis of the current training offer in Europe has been completed, in order to provide information collected on port management, and on the application of sustainable tools in port management. The Master's courses examined belong entirely to the area of the countries belonging to the EU:

- The languages in which the courses are treated are: English, Spanish, Italian and Portuguese. Nevertheless, English represents the language of delivery of almost 60% of the courses. This is due not only to the large number of master's degrees delivered by UK universities compared to the total, but also to the choice of English as global language by other European universities. In addition, in some cases where universities provide courses in their mother tongue, there is also the possibility of taking courses in English
- Another parameter that needs attention is the duration of the master's program, which varies according to both the training credits for the course offered and the country to which it belongs. As can be seen in Figure 2, the number of courses lasting between 6 and 12 months is higher than for the others; whereas for the category of port management in question there does not seem to be a clear preference for courses lasting less than 6 months or between 12 and 18 months. Finally, there is a significant figure in correspondence with master courses that have a duration of more than 18 months (Fig. 2).
- The training credits of the individual master's programme across Europe ranges as follows: about 41%, with training credits between 60 and 90, followed by 17.64% with credits between 90 and 120 and between 150 and 180. The two opposite poles of the analysed sample, that is several credits lower than 60 and higher than 180 are equally represented; in this regard it is important to point out that the presence of masters with training credits lower than 60 is not generally common. Moreover, it is possible to observe that within the sample courses analysed there are no masters with credits between 120 and 150.
- There is a fair distribution between Southern Europe - mainly in Spain - and Northern Europe with a clear majority located in the United Kingdom, while a small percentage of masters are attributable to Central Europe (Germany and France). It is possible to notice a greater concentration of master's courses on coastal locations, often characterized by large commercial and/or tourist ports. The percentage of masters in inland cities is in fact minimal (8.69%).
- Finally, it is necessary to make a distinction between two different forms of delivery of courses: in person and online. Generally, an in person approach is preferred, where interaction and debate can lead to actively involve students. However, it is often necessary to meet the needs of the majority, who find themselves unwell at physical meetings or in regions – or even countries – other than those in which the course is given. The 86,96% of the analysed masters are in person, and only 8,70% are online.

The statistical analysis undertaken aim of identifying the recurrent themes in the identified master's courses. For this reason, it was necessary to create areas of knowledge in which the various disciplines of the masters were initially clustered based on port management principles: sustainable port management, and environment sustainability. Therefore, categories have been created a priori and modified, or integrated, during the classification itself; categories are listed now below and, for each of them, the main contents are described.

a) **Juridical Area: standards & laws**

The *legal area* contains within itself all those disciplinary modules that deal with legislative aspects such as the main regulations and standards of navigation or even of contracts, as well as the legal aspects of insurance or aspects related to environmental regulation. An in-depth knowledge of the law of the main EU states, applicable to contracts for the international sale of goods and transport of goods, shipping and aspects relating to the ownership and operation of ships, including chartering, detention and registration of the ship itself, will be provided. For example, disciplines such as "*Maritime law*", "*Port legislation and insurance*" and "*International contracts*" belong to this area. For what concerns environmental regulation, this area contains modules like "*Environmental Law and Policy in Practice*", which explores the rules that a generic enterprise must deal with, to be compliant with EU or regional laws.

b) Operational Area: logistic, transports & trade

The *operational area* includes, instead, those aspects strictly related to logistics, supply, transport, also including international trade. It will then present the tools needed to assess strategies for the provision of logistics services, as well as the processes and strategies of international trade and the principles that govern them. For example, the subjects “*Maritime logistic*”, “*International trade*” and “*Global transport system*” have been associated with this area.

c) Business Area: economy & finance

The *business area* includes those disciplines relating to economic and financial topics. The role of corporate finance in the maritime industry will therefore be explored, including the interpretation of traditional accounts and the analysis of corporate performance and approaches to the assessment of investments, which have fallen into the port context, as well as the main instruments of microeconomics and macroeconomics in a sector strongly influenced by endogenous and exogenous factors. This category includes disciplines such as “*Maritime economics*”, “*Business environment*” and “*Capital budgeting and finance*”.

d) Management Area: organization & strategies

In the *management area*, on the other hand, the tools and knowledge needed to manage a company are provided, regardless of the sector of activity in which it operates. The knowledge of this category will allow you to have a general, but clear, view of the different “realities” to be managed in the company and the universal principles of action, so you can start to acquire what are traditionally called “managerial skills”. In addition, knowledge is provided on the main business strategies to be applied in order to achieve the objectives set. It is certainly the most homogeneous category, including disciplines such as “*Project management*”, but also “*Human resources management*”, “*Procurement management*” or “*Port business strategy*”.

e) Security Area: risk, health & safety

The *security area* provides a complete understanding of the main theoretical foundations of risk management strategies in a business context and supply chain necessary to critically evaluate the appropriate responses to risk. The module also explores maritime security, providing the tools needed to address, for example, a sudden influx of migrants into the sea, resource and territorial disputes, challenges to freedom of navigation and the management of the threat of piracy and/or smuggling. Security area also deals with aspects of risk management which are strictly related to environmental risk assessment. In this category you can find the disciplines “*Risk and safety management*”, “*Maritime Security*”, “*Insurance, Health & Safety*” and “*Environmental Impact Assessment*”.

f) Basic Area: tools & techniques

The *basic area* includes those basic subjects necessary to provide the basic tools needed to build a solid foundation on which to expand their cultural background, so as to have a complete education in a multidisciplinary context. It is no coincidence that these subjects have been classified as “*Operational Research*”, “*Research Techniques*” or “*Maritime English*”.

g) Engineering Area: technologies

The *Engineering area* is the area of interest characterized by a strong technical-scientific connotation, which aims to apply the knowledge and results of mathematical, physical and natural sciences to produce systems and solutions that can meet a wide variety of technical needs also applicable in the maritime industry. In light of this, it includes disciplines such as “*Integrated Manoeuvring/Propulsion and Navigation Systems*”, “*Technology and Innovation*” and “*Maritime Technology*”.

h) Marketing Area: industry & communication

In the *Marketing area* we provide the necessary skills to properly analyse the maritime industry, useful to manage the correct strategies at industry and corporate level. It deals, therefore, with the study and description of the market in question and, in general, with the interaction of the market and the users of a company. The subjects in this category are less heterogeneous and include, for example, “*Information and communication technologies and environmental education*”, “*Marketing & communication*”, “*Customer Service*” and “*Research and commercial skills*”.

i) **Infrastructure Area: construction & planning**

The *infrastructure area* defines a precise network of goods and services which, although not operating directly on the production system, is fundamental for the design, development and construction of ports. It contains, therefore, “*Types of ports*” or “*Technical and planning of port areas*”.

An additional module has been added for the Masters in Sustainable Port Management and Sustainability, as described below.

j) **Ecological Area: sustainability, environment & pollution**

The *ecological area*, the real heart of the master's class in sustainable port management, provides an understanding of the main theoretical treatments on sustainability applied to business and to ports. It describes useful measures to reduce emissions during navigation and some of the typical operations of the port area. More radical concepts such as ecological models, including the concept of resilience, will be introduced, all discussed in the context of scientific topics on natural limits such as resource consumption, pollution, carbon dioxide and climate change. Topics such as the use of renewable energy sources and other green technologies will also be explored. This area includes “*Marine environment and pollution*”, “*Sustainability for business*”, “*Environmental management in ports*”, “*Offshore renewable energy*”, “*Green ship design and technology*” and “*Climate Change & Carbon Management*”.

The masters focused on port management – through the analysis of the sample observed – are mainly concentrated on four different areas, respectively: Operational, Management, Juridical and Business. Since the masters in “Port Management” is intuitive to expect a greater concentration of subjects in the category of Management, however, this is not too significant as you might think in the first analysis. It is also surprising that there is such a high percentage for matters relating to the legal area that it includes both matters relating to regulations and matters of law in the broadest sense.

3 RESULTS

3.1 Appendices

3.1.1 Abbreviations and Acronyms

- CO₂: Carbon Dioxide
- EEDI: Energy Efficiency Design Index
- EU: European Union
- GHG: Greenhouse Gas
- IMO: International Maritime Organization
- LNGas: Liquefied Natural Gas
- MARPOL: Marine Pollution
- NO₂: Nitrogen Dioxide
- OPS: Onshore Power Supply
- PM: Particulate Matter
- SO₂: Sulfur Dioxide
- UNCTAD: United Nations Conference on Trade and Development

WHO: World Health Organization

3.1.2 Figures and Tables

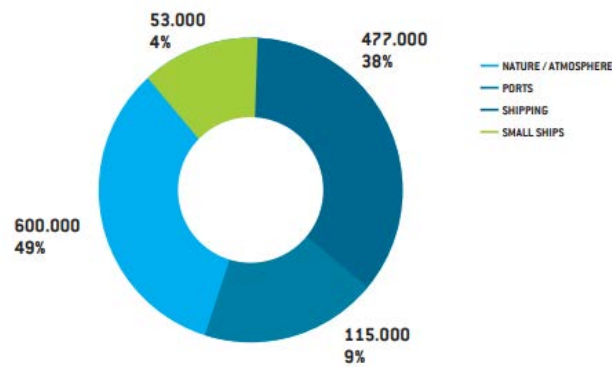


Figure 1. Maritime sources of marine pollution by hydrocarbons in metric tonnes per year.
Source: Moreau, 2009

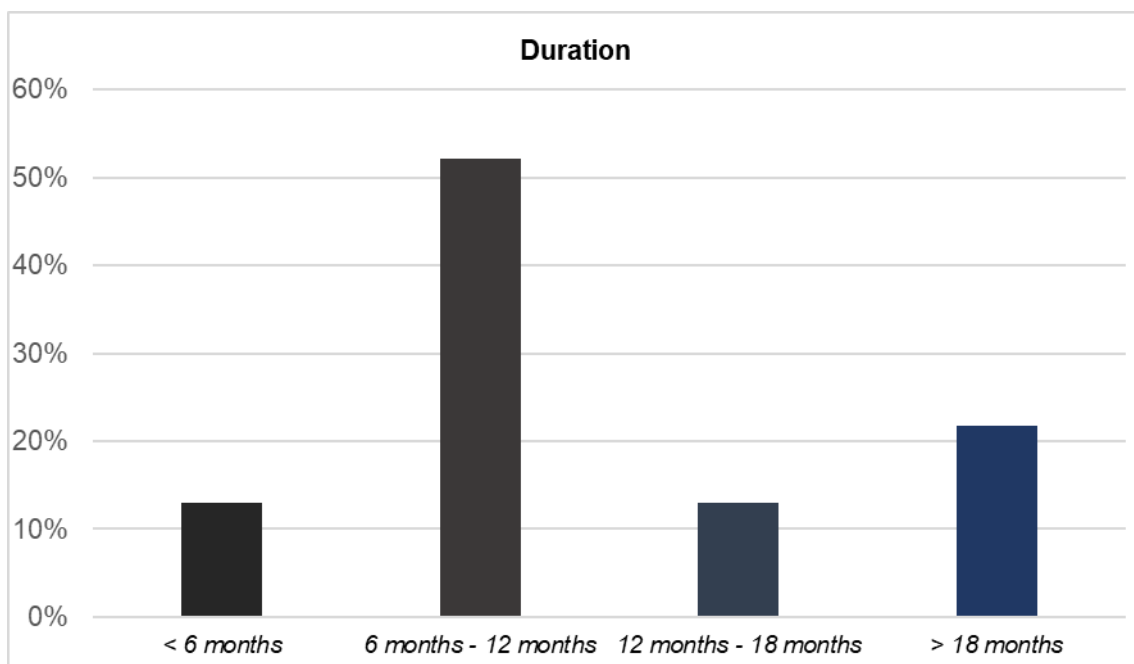


Figure 2. Port manager master's duration

4 CONCLUSIONS

Southern European countries host more masters than the other areas taken individually. This confirms the maritime vocation of the southern countries, while the scarce contribution of the Central European countries, mainly continental, was predictable. Finally, it should be noted that although the masters delivered by the southern states (aggregated) cover 53% of the offer, the United Kingdom is the country with the largest number of masters. Furthermore, it is possible to observe that almost all the masters in this category are based in port or river cities. One exception is a master's degree based in the Spanish capital, Madrid. As we have seen, the tendency is for the masters to be available in English, and for the training to be in person. Even though there are many masters dedicated to port management, there is no one that is exclusively responsible for achieving carbon neutral management, despite the importance that the achievement of not depending on fossil fuels, with a significant influence on transport, is currently acquiring.

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REFERENCES

- [1] Christine Gable; Scott Gable. (2020). Carbon Neutral Alternative Fuels. Retrieved from ThoughtCo. website: <https://www.thoughtco.com/what-does-carbon-neutral-mean-85348>
- [2] Carlier, M. (2011). Emisiones de gases a la atmósfera procedentes de buques. *ANAVE*, 11–17.
- [3] UNCTAD. (2018). 50 Years of Review of Maritime Transport, 1968-2018: Reflecting on the past, exploring the future. *50 Years of Review of Maritime Transport, 1968-2018: Reflecting on the Past, Exploring the Future*, (812), 86p.
- [4] WHO. (2005). WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide.
- [5] Moreau, R. (2009). Nautical Activities: What Impact on the Environment? a Life Cycle Approach for "Clear Blue" Boating - Commissioned By the European Confederation of Nautical Industries - Ecni. (June), 1–66.
- [6] IMO. (1998). Marpol 73/78. *Regulation*, 44(0), 1–14.