Sustainability Assessment of Master Commercial European Ports Through Environmental Prismas

Archontoula Koskeridi and Vassiliki Balla

Abstract The functionality of European ports is the central interest of worldwide industry in current times. After the pandemic, ports must reassure that they are ready again to create economic and social value to the global economy as they manage to sustain their functions and continue their operations in an environmentally friendly manner. Healthy environment, safety issues, wind and solar energy and waste management are some of the many axes that current assessment will be based on. Master ports of Europe will be compared based on their environmental responsibility and performance. At the same time, climate change demands modifications to port operations and functionality. What is the role of robots in nowadays transportation? How automated processes affect in overall sustainability? Digitization of processes and innovation in operations are key elements of assessment in transport industry. Still each port follows specific rules, and native management style let alone must be aligned to current government policies. Does this in line mean that power countries play crucial role to the maintenance and further development of environmental management system that master ports follow?

Keywords Sustainability management · Environmental economics · Transport · Tourism

JEL Classifications Q01 · Q56 · Q5 · Z30

1 Introduction

Ports' operations offer to humanity by contributing to the direct and indirect employment of people, and as such, they play an essential role in the economic development

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of each country (Roh et al., 2016). One could say that on the one hand, they act as social caretakers for workers and communities, reinforcing and supporting socio-economic priorities. In Europe, 2200 port operators employ more than 110.000 workers involved in loading and unloading ships and port services such as warehousing and logistics (Van Hooydonk, 2014). Moreover, ports are inevitable stations in maritime supply chains (Notteboom et al., 2020). They are characterized as numerous gateways for international trade. Eleven billion tons of maritime trade were carried by almost 98.140 ships as of 2018, accounting for about 60–70% of the value of global trade and 80% of trade volume (United Nations Conference on Trade and Development, 2020a). Shipping and ports have been the spearhead of global transport even in the worst crises, especially in pandemic COVID-19, transporting necessities such as food, medical supplies, primary materials, and manufactured products all over the world (UNCTAD, 2019a, 2020a). Since ports are hubs in the supply chain and, in combination with the scale of their port activities, they cause environmental and social externalities (Dinwoodie et al., 2012).

On the other hand, they bring negative impact to the environment even though they contribute significantly to the economy (Walker et al., 2019). Their different functions cause environmental impacts, that is, connectivity with maritime and land transport networks, cargo handling, logistics and distribution activities, industrial and semi-industrial activities, and energy production and distribution (Notteboom et al., 2020). Serious impacts on the environment are also created by the expansion and operation of ports and by shipping activities (Acciaro et al., 2014), for example, by emissions from combined transport serving inland ports and from ship berthing (Lam & Notteboom, 2014). Seas and oceans are affected by the negative impacts caused by ports and exacerbate the already existing problem (Darbra et al., 2009). They also cause local air pollution, noise and light pollution, traffic congestion, import of invasive species, and impacts from marine accidents and spills (Walker et al., 2019).

This research aims at building to contribute to the existing literature by providing a comparative overview of the largest commercial European ports and then to analyze the environmental sustainability of each port and the whole sample, using specific criteria. The rest of the paper is organized as follows: In the second section, the importance of sustainability for ports is analyzed; then in the third section, the data used for the research and given useful information about them is analyzed; and in the next section, the criteria and their subcategories are discussed. The paper concludes with the fifth section in which presents the results. The research is based around the following questions: Q1—Are all ports at the same level of sustainability and if not is there a difference between them in this direction? Q2—Is there a difference according to their location? Q3—Are measures for the sustainability of the ports in the sample being implemented?

2 Sustainability

In World's Association for Waterborne Transport Infrastructure (PIANC, 2022) definition of sustainability, a sustainable port is one in which the port authority, alongside with port users, proactively and responsibly adopts a green growth strategy. It ensures that through this strategy the long-term vision of the port is achieved promoting simultaneously the stakeholder's participation to meet the contemporary needs of the region it serves. Port sustainability includes addressing social needs, the economic development management system, and the concepts of minimizing port environmental externalities (Cheon, 2017; Cheon et al., 2017; Laxe et al., 2017).

In addition to the social and economic dimensions, one of the three dimensions of sustainability that have been specified is environmental sustainability (Giddings et al., 2002; Souza & Alves, 2018). Also, the public authorities and the wider community put strong pressure on ports to fulfill their social responsibility (De Grosbois, 2016). Consequently, it is becoming more and more important for ports to improve their "corporate responsibility (CR) profile" in order to appear environmentally conscious and sustainable and to respond to local community pressures and regulatory requirements (Acciaro, 2015).

The issue of an environmentally sensitive and sustainable attitude presents several challenges because it involves various issues, such as limiting emissions caused by current and upcoming port activities. Therefore, ports, in the spirit of sustainability, seek to increase their efficiency and performance and, consequently, their ability to compete as well as their impact to the wider economy. Meanwhile, the ports are taking a more socially active policy toward their local societies and a stronger environmental management, respecting the current rules (Sislian et al., 2016; Wang et al., 2021). Several ports are trying to become more "green" by incorporating and taking proactive practices and measures to reduce their impact on their environmental footprint (Davarzani et al., 2016), with users' and stakeholders' demands more and more concentrated on a more complete and holistic perspective so as achieve a balance among environmental, social, and economic interests.

The ports enclose various enterprises involved in a range of activities and provide a large number of services (Hakam, 2015). These enterprises are environmentally hazardous because of their characteristics, that is they produce a large amount of waste, and they release large scale of emissions and the noise pollution (Darbra et al., 2005). To minimize this damage, the sustainability comes first as the most significant aspect (Broesterhuizen et al., 2012).

3 Data

The data of this research have been derived from Sustainability Reports of the ports, as well as from recent Port Environmental Reports and recent Port Environmental Reviews. The data dates range from 2019 to 2021. Additional data were also retrieved from port's official websites. However, some ports created Master Plans—in which their environmental issues are mentioned—or other small issues for some additional information in an environmental category. The ports selection was based on Eurostat table from the archive image of the 20 largest container handling ports, 2008–2018.[1] This list was chosen as a guide because container handling ports provide high energy consumption and as such this is associated with the greatest need for energy consumption. Even though, in the corresponding list, the investigation ports amount to 20 only 17 were included to the research sample, as ports of Gioia Tauro, Izmit, and Ambarli—did not provide sufficient information. Therefore, given that 85% of the Eurostat list is gathered, the sample is considered adequate to provide secure results about the sustainability of European ports.

4 Criteria

According to the Word Port Sustainability Program (WPSP), their seventeen Sustainable Development Goals (SDGs) are grouped into five categories:

- Climate and Energy.
- Resilient Infrastructure.
- Safety and Security.
- Community Outreach and Port-City Dialogue.
- Governance and Ethics.

However, a report by European Sea Ports Organisation (ESPO) gives another comparison perspective such as:

- The instruments for achieving environmental ambitions (e.g., Port Vision, Spatial planning and infrastructure management, Port charges, etc.).
- Environmental management framework/environmental management standards (e.g., EcoPorts, ISO 14001, etc.).
- The development of environmental and sustainability management in ports.
- Elements of environmental management progress.
- Assistance tools and methods (e.g., Port Environmental Review System (PERS)).
- Established systems.
- Approaches to addressing environmental priorities (Air quality management, Energy conservation and climate change, Noise management, Waste management, Water management (consumption and quality, etc.).

Previous research dealing with similar issues has reported water and air quality as the main environmental problems together with waste disposal, noise of the areas, and conservation of their habitats (Comtois & Slack, 2007). Some other research included soil emissions, sediment and water discharges, and resource consumption (Puig et al., 2015). Many studies have been conducted on air quality (Winnes et al.,

[1] See Appendix, Fig. 10 "Top 20 ports handling containers, 2008–2018."

2015; EcoPorts, 2016; Lam & Notteboom, 2014), noise (Khoo & Nguyen, 2011; Mustonen, 2013; Schenone et al., 2014; Witte, 2016), and water pollution (Grifoll et al., 2011; Kröger et al., 2006). Water pollution is caused by waste disposal, ballast water, fuel oil, cargo, and oil spills (Ng & Song, 2010; OECD, 2011; Lam and Notteboom, 2014).

Although in literature review the ports' reports have a different pattern, which means that they were not organized in the same order of topics and with the same themes, in current research the criteria were organized into subcategories, in such a way so as to highlight the ports' similarities and differences.

1. *Safe and Healthy Environment*

All port data were compared among each on a basis of "Safe and Healthy Environment," which exposes the quality of flood risk management, as it is being affected directly by climate change. In addition to that, this criterion includes organized truck stops, which provide the rest necessary facilities such as toilets, showers, and security surveillance. Moreover, there is a discount for clean shipping that some ports may offer to ships that maintain all the compliance protocols for safe and healthy environment. In this criterion, the surrounding area of each port weighs significantly. Also, the measures that a port can take have a special weight, as with specific actions and measures it could attract more species or it could assist in the appropriate reproduction and co-existence of existing ones. Some examples are the Bird Valley in Rotterdam's port, that many different species of coastal birds and singing birds can be found in the valley. At the port of Antwerp, one of the measures taken is created of a "spawning zone" for the reproduction of fish and makes smooth quay walls rougher to create a refuge where small aquatic animals could live. Also, in the port of Bremen-Bremerhaven there is the Luneplate (an official EU bird habitat), and the near river Billerbeck is suitable as a habitat for plants and animals. Figure 1 shows the percentages of all ports and their contribution to this criterion. It can be observed that the ports of Rotterdam, Antwerp, and Bremen-Bremerhaven have a high contribution of 14%, while there are many ports with zero contribution, such as Gdańsk, Mersin, and La Spezia, or a minimal contribution of 3%, such as Le Havre and Algeciras. This result is considered rather logical given that these ports are bigger and as such are expected to demonstrate better safety regulations (Fig. 2).

2. *Climate and Energy*

The next criterion under assessment is "Climate and Energy." This represents the energy that each port uses, whether it is solar, wind, or electric. The outcome may be twofold. The port may have carried out an agreement to provide a different form of heat source such as steam some ports have carried out this agreement such as the ports of Rotterdam and Antwerp, or shore power, which allows ships ashore to shut down their engines or generator and connect to the grid. The latter reduces emissions (NOx, Sox, and particulate matter in ports' air), improves air quality, and reduces noise pollution. LED lights and upgraded terminals are included in this category alongside with the carbon capture and storage. Additionally, port's carbon footprint

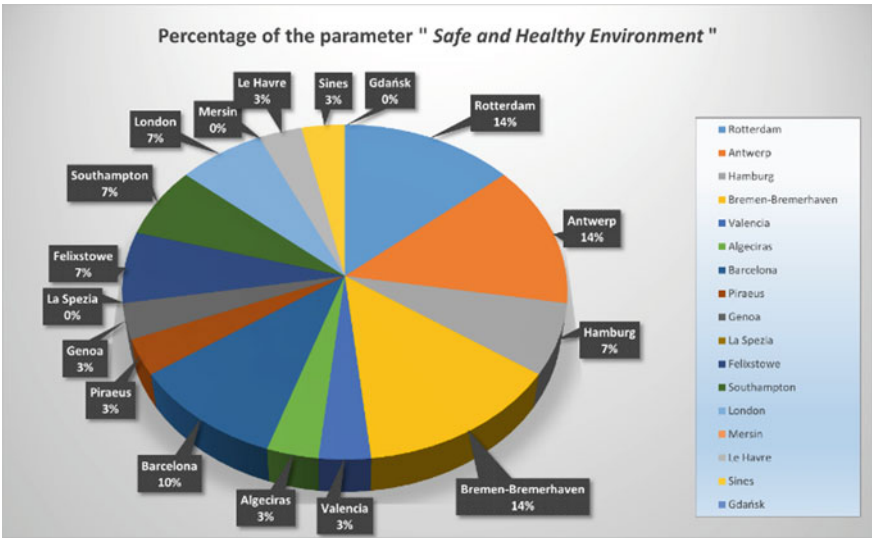

Fig. 1 Percentage of the parameter "Safe and Healthy Environment"

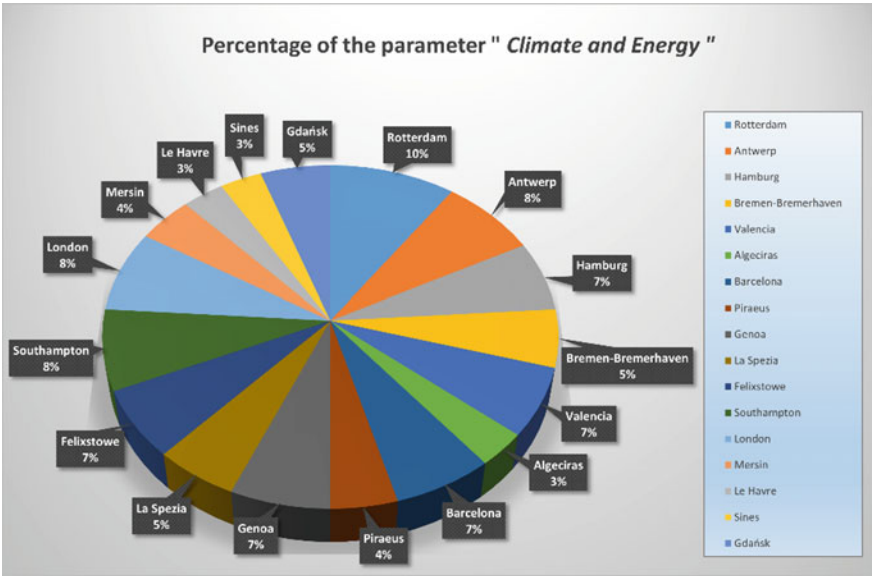

Fig. 2 Percentage of the parameter "Climate and Energy"

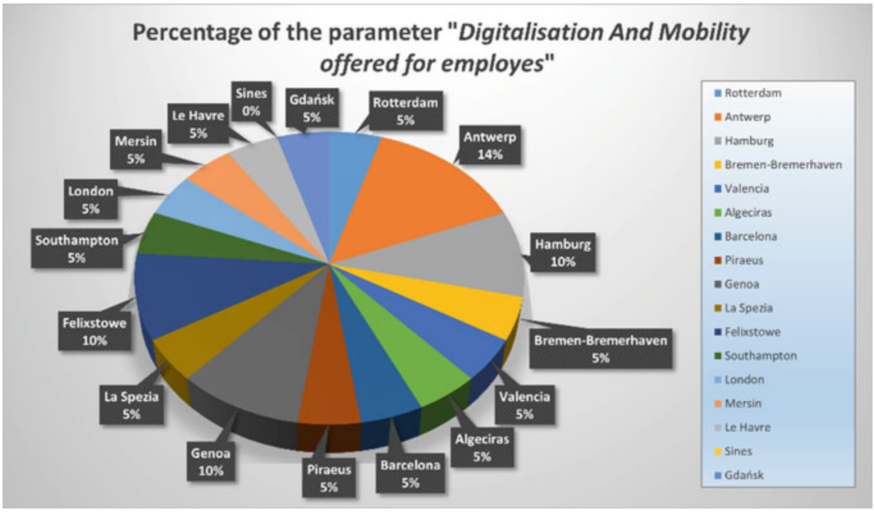

Fig. 3 Percentage of the parameter "Digitalization and Mobility offered for employees"

is also included in this criterion. Most importantly, this criterion assesses each port's energy management which is measured by environmental review tools such as ISO[2] and PERS[3] certifications.

Figure 3 provides percentage levels of all ports. The port with the highest percentage for this criterion is the port of Rotterdam with 10%, followed by the port of Southampton, London, and Antwerp with 8%. However, the ports with the lowest percentage are Algeciras, Le Havre, and Sines with 3%.

3. *Digitalization and Mobility Offered for Employees*

Digitalization is a rather powerful tool for ports as it provides timely mistake and omission prevention and information analysis. For example, it can be used for the estimation of the project's duration as well as the assessment of its infrastructure damage. Furthermore, digitization can provide an organization in the port area, either in terms of organizing traffic in the larger area of the port or in terms of sharing (live) data and information with several people at the same time. This can be achieved

[2] ISO certification is a seal of approval from a third-party body that a company runs to one of the international standards developed and published by the International Organization for Standardization (ISO). The ISO are an independent, non-governmental international organization who brings together experts to share knowledge and develop international standards that support innovation and provide solutions to global challenges. ISO Quality Services LTD, Source: https://www.isoqsltd.com/faq/.

[3] The Port Environmental Review System (PERS) does not only incorporate the main general requirements of recognized environmental management standards (e.g., ISO 14001), but also takes into account the specificities of ports. PERS builds upon the policy recommendations of ESPO and gives ports clear objectives to aim for. A PERS certification is valid for a period of 2 years. EcoPorts Tools, Source: https://www.ecoports.com/pers.

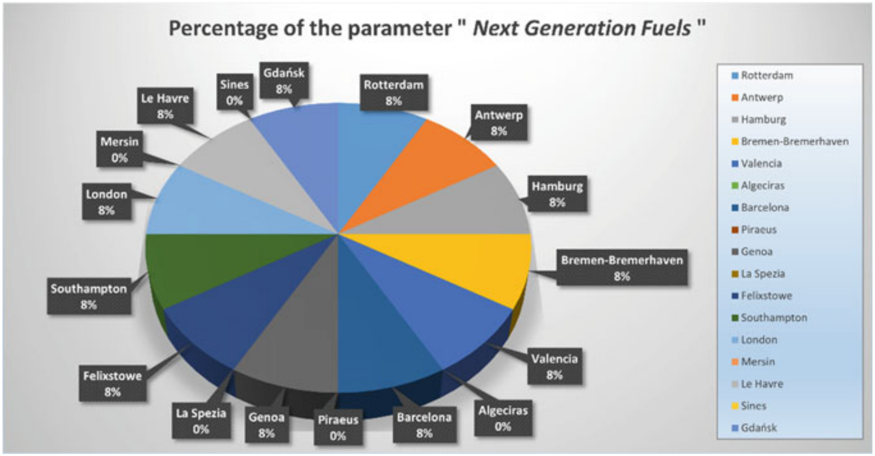

Fig. 4 Percentage of the parameter "Next Generation Fuels"

through technological programs and simulations of the whole port (such as buildings simulations, ones of bridges, and seabed) and with the assistance of the autonomous vehicles, the autonomous inland waterway vessels, and the drones. In combination with digitization, this criterion also reveals the projects and actions of some ports that have implemented eco-transport for their employees. For example, the Port of Antwerp has created the Bike Bus, which is a bus that takes its employees from one side of the port to the other, together with their bicycles through the tunnels and the Waterbus that takes them from the city to the port and vice versa together with their bicycles. Similar practice the Port of Bremen-Bremerhaven follows providing its employees with a subsidized "job ticket." Examining Fig. 3, Antwerp accounts for 14% of the total, with the ports of Hamburg, Genoa, and Felixstowe coming in second place. However, the smallest percentage is the 0% belonging to Sines, concluding that for this criterion no condition is satisfied.

4. *Measures*

Through this criterion, extra measures are assessed related to green policies. In more detail, such measures may include:

1. Energy-neutral buildings (triple glazing, heat and cold storage, and underfloor heating).
2. New types of asphalt.
3. Reducing energy consumption by running the fleet at lower speeds.
4. 24-h air quality monitoring stations,
5. SWOT analyses.
6. Additional bicycle parking and a charger for e-bikes.

Among all seventeen ports, no port was found that has not created additional measures to protect the environment, either more complex or simpler, so in this case there was no differentiation in percentages.

5. *Next Generation Fuels*

Fuel is one of the first sources of CO_2 release, so throughout the years many ports have made it their goal for their fuel source to release zero emissions. The main new generation of fuel found in ports is Liquefied Natural Gas (LNG). However, some ports also provide other types of fuel such as green hydrogen, blue hydrogen, gas to liquids (GTL), and biokerosene. Hydrogen is a fuel that has the advantage of being "burnt" without emitting carbon dioxide. On the other hand, blue hydrogen is produced by steam reforming of methane, whereas the carbon dioxide emissions are captured and stored with appropriate technology. Green hydrogen is produced via electrolysis of water and energy from renewable sources, such as the sun and wind. GTL is an alternative diesel fuel derived from natural gas, which burns cleanlier than conventional crude oil-based diesel.[4] Nonetheless, several ports are using other fuel sources, such as advanced diesel. In Fig. 4, these ports are listed with a percentage of 0%, while ports that have moved to the next generation of fuel are listed with a percentage of 8%.

6. *BIO*

The criterion "BIO" includes four parameters. The first one is the '**Bio-based cluster**', which reuses products (e.g., reuse and exchange of raw materials, such as a processing plastic waste, reuse of water) or supplies bio-based chemicals to factories. The next one is the '**Recycling Hub**', which includes actions and equipment, such as plastic and waste cleaning action organizations, waste and plastic collection vessels, and land-based waste management systems. Also, it includes waste separation and recycling of waste. Moving on to the '**Clean Port**' parameter, this refers to allocate everything a port does to be cleaner and greener. For example, Rotterdam's port has created 250-ha depot for contaminated dredged material, while the port of Antwerp researches and remediates soil, processes the contaminated sludge, makes regular checks in the waterbed quality, and makes durable cleaning of hulls and propellers. One more example is that of Bremen-Bremerhaven's port which introduced regulations for dealing with waste water from ships, such as the ballast water, the waste water from the scrubbers, and the domestic waste water. Finally, the fourth parameter '**Economic**' indicates ports that have a circular economy or circular chemistry. Figure 5 shows that most ports have a percentage in the 3% criterion, but the port of Antwerp has the highest percentage with 13% and the port of Barcelona has the lowest percentage with 0%. But these results were expected. Usually, the ports with the highest percentages for this criterion (13 and 10%) are also the largest ports which are able to ensure spatial and economic and other environmental protection measures.

[4] Shell GTL Fuel, Source: https://www.shell.com/business-customers/commercial-fuels/shell-gtl-fuel.html.

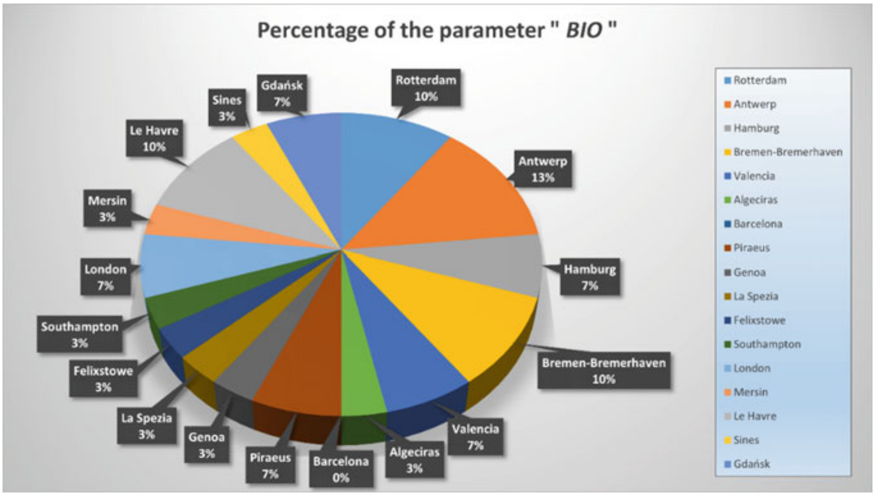

Fig. 5 Percentage of the parameter "BIO."

7. *Environmental Performance Indicators*

This criterion promotes the necessity to address the main environmental problems created by ports, such as air emissions, noise, and odors. In more detail, this criterion includes ports that have indexes for accident prevention, port cleanliness, and indicators related to climate change and energy transition. However, only the port of Piraeus and port of Bremen-Bremerhaven uses the QM Port indicator (Quality Management System indicators) and PERS. None of the rest ports have developed the exact environmental performance indicators. Furthermore, the ports evaluate their water quality, but the indicators used are not clearly mentioned and therefore removed from the generation of the figures. For example, the port of Piraeus for its seawater quality specifies that it measures pH, Salinity, BOD, COD, Enterococci, E-Coli, Total Coliforms, TDS, and Heavy Metals. Under these conditions, the percentages generated in the respective ports are presented in Fig. 6. With the highest percentages being in the ports of Rotterdam and Antwerp at 24%, the next highest percentage is 10% in the ports of Sines, Gdansk, Barcelona, and London, while the remaining 11 are at 5 and 0%.

8. *Database-Programs*

In the criterion "Database-Programs," all the programs that assist the ports to cope with their daily operations have been added together with the databases that each port handles. For example, Digital twin is a program that visualizes the port's facilities and can assist ports in reducing emissions, improving security procedures, and sharing data efficiently. However, all ports have their respective criterion resulting in a 6%

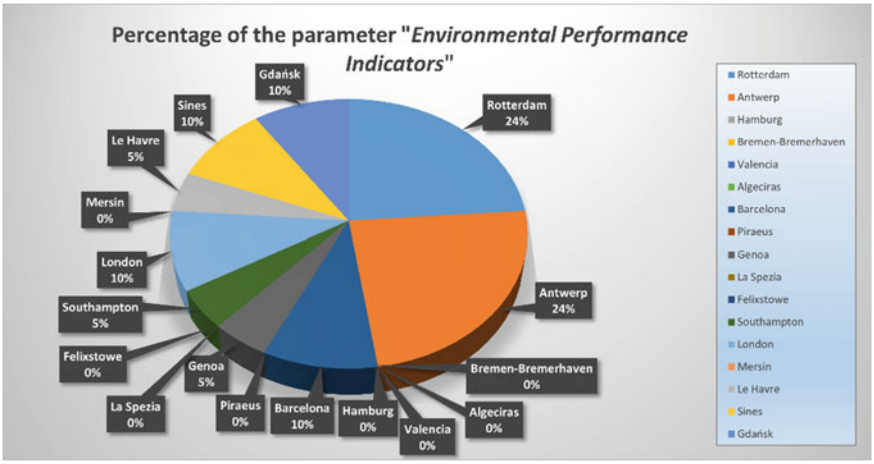

Fig. 6 Percentage of the parameter "Environmental Performance Indicators"

share in each apart from La Specia. However, each may have different programs and bases.

9. *Climatology Programs*

Each port has projects and programs to improve their ecological footprint, so that each one can contribute in its own way to a cleaner environment. For example, the port of Antwerp participates in the project "Operation Clean Sweep," where the main objective is to avoid the discharge of pellets into the environment, and the port of Bremen-Bremerhaven runs the research project called "Port Klima," which develops education and training modules for integrating adaptation to climate change. All ports, apart from La Specia, take significant actions through climatological programs, ensuring the community of their green concerns.

10. *Sustainable Development Goals (SDG'S)*

"The Sustainable Development Goals (SDGs), also known as the Global Goals, were adopted by the United Nations in 2015 as a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity.[5]" These 17 goals are integrated. They support the idea that the ports must balance between environmental sustainability and economic prosperity. The importance of this criterion is therefore quite significant for the progress and optimization of both the environment and the society. However, some ports did not provide information or when this was provided it was minimal and therefore the percentage is zero or very low. Figure 7 presents the highest percentage of the criterion is 12% belonging to the port of Antwerp and next with 11% is the port of Valencia.

[5] United Nations Development Programme, Source: https://www.undp.org/sustainable-development-goals.

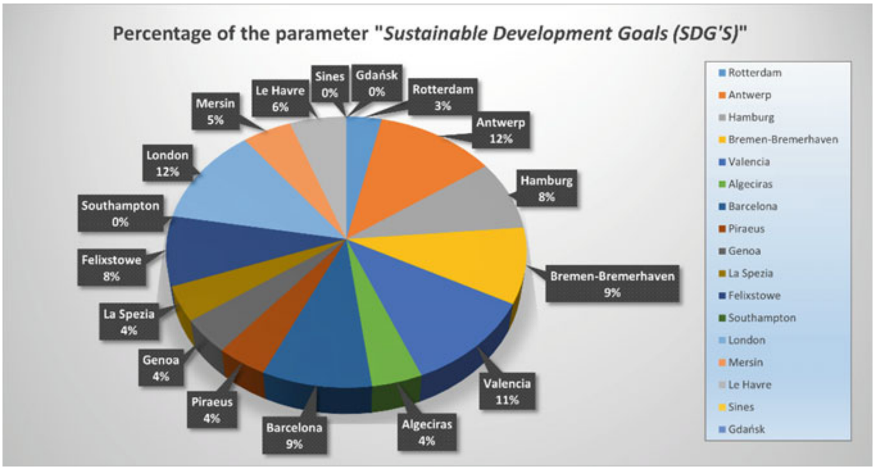

Fig. 7 Percentage of the parameter "Sustainable Development Goals (SDG'S)."

11. *GRI (Global Reporting Initiative)*

The GRI Standards are a modular system of interconnected standards. They allow organizations to publicly report the impacts of their activities in a structured way that is transparent to stakeholders and other interested parties.[6] Table 1 presents the categories of the GRI parameter for which ports.

In Fig. 8, it can be identified that several ports do not record the GRI standards in their reports; therefore, they have been assigned the 0% rate. However, the port of Bremen-Bremerhaven has the highest percentage with 18%, followed by the port of Piraeus with 17%.

12. *MARPOL*

The International Convention for the Prevention of Pollution from Ships (MARPOL) is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes.[7] It is therefore an important criterion as it links pollution to the marine environment and ships. Table 2 shows the criteria for the full protection of the marine environment under the MARPOL Convention, which was also another criterion for comparing port reports.

[6] https://www.globalreporting.org/media/wtaf14tw/a-short-introduction-to-the-gri-standards.pdf.

[7] https://www.imo.org/en/KnowledgeCentre/ConferencesMeetings/Pages/Marpol.aspx.

Table 1 GRI categories

GRI (Global Reporting Initiative)	
102—General disclosures	402—Labor/management relations 2016
103—Management approach	403—Occupational health and safety
201—Economic performance	404—Training and education
202—Market presence 2016	405—Diversity and equal opportunity
205—Anti-corruption	406—Non-discrimination
203—Indirect economic impacts	407—Freedom of association and collective bargaining
204—Procurement practices	408—Child labor
206—Anti-competitive behavior 2016	409—Forced or compulsory labor 2016
207—Taxes 2019	410—Security practices 2016
301—Materials	411—Rights of indigenous peoples 2016
302—Energy	412—Human rights assessment
303—Water and effluents	413—Local communities 2016
304—Biodiversity	414—Supplier social assessment 2016
305—Emissions	415—Public policy 2016
306—Waste	416—Customer health and safety 2016
307—Environmental compliance	417—Marketing and labeling 2016
308—Supplier environmental assessment	418—Customer privacy 2016
401—Employment	419—Socioeconomic compliance

Figure 9 shows the ports that mentioned the MARPOL criteria in their latest reports, with the highest percentage being the port of Bremen-Bremerhaven with 16%, followed by the port of Piraeus with 14%. However, 35% of ports show a rate of 0% for this criterion.

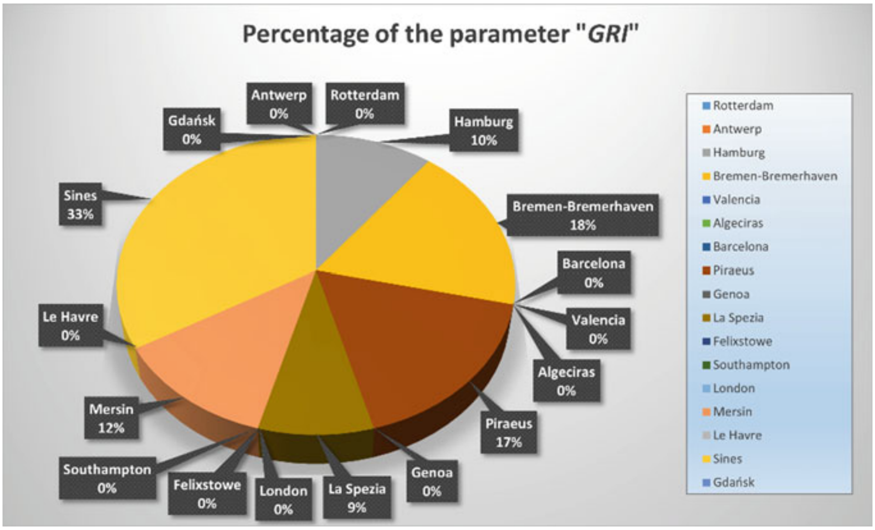

Fig. 8 Percentage of the parameter “GRI”

Table 2 MARPOL categories

MARPOL (International Convention for the Prevention of Pollution from Ships)
Annex I—Prevention of pollution by oil
Annex II—Carriage of chemicals by ship
Annex III—Prevention of pollution by harmful substances carried by sea in packaged form
Annex IV—Regulations for the prevention of pollution by sewage from ships
Annex V—Prevention of pollution by garbage from ships
Annex VI—Prevention of air pollution from ships

Results

This paper concludes that Europe’s largest container ports differ from each other in terms of their environmental character, as presented in Table 3. This table breaks down the overall percentages by adding all the criteria and their parameters analyzed in the current research in an ascending order. All the criteria are 12 so the highest percentage for the ports that could be evaluated in this table is with the percentage 12. In other words, in the northwest of Europe there is an upward trend, ports to be more technologically, ecologically, and environmentally advanced than others. This in line enhances the idea that these ports present themselves as being more environmentally conscious. However, this cannot be considered entirely attainable as in the development of a business, the economy of the respective country it belongs play a major role to its sustainability goals. That is, a better economy also corresponds

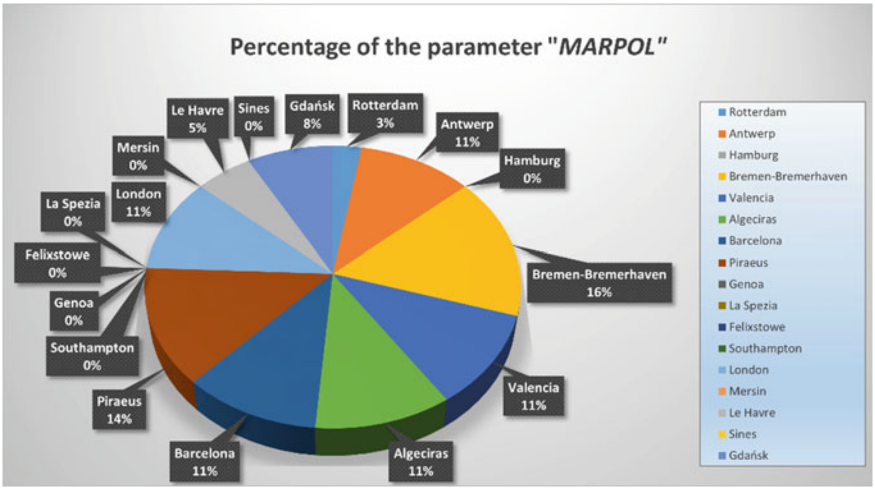

Fig. 9 Percentage of the parameter "MARPOL"

to the greater provision of money for appropriate technological development, such as the creation of smartports, and in combination with the environmental awareness of all those involved gives the result of creating a greener port. However, this does not leave the other ports behind as they too enter the game of competition and cooperation to sustainable world. Although they do not fulfill all the facilities of larger ports, still they are following significantly at their own pace. Having all the necessary measures and means for the environmental safety and protection of their environment and waters, they are struggling to manage in a greener manner.

Although various intersections of daily life were affected during the years of the pandemic, this did not significantly affect the environmental duties of several ports, as their upward trend from the rift and reefs of previous years is evident. Still, their adaptability to the new circumstances throughout these years is worthy of mention, in addition to some ports made sure to add the necessary equipment to deal with a possible new pandemic.

Table 3 Final percentage by adding all the criteria of the parameters in the research

No	Ports	Final percentage
1	Antwerp	10.2
2	Bremen-Bremerhaven	8.9
3	Rotterdam	8.3
4	London	8.0
5	Barcelona	7.4
6	Valencia	7.3
7	Hamburg	7.3
8	Felixstowe	6.7
9	Le Havre	6.6
10	Genoa	6.3
11	Piraeus	6.2
12	Gdańsk	6.2
13	Southampton	6.0
14	Algeciras	5.2
15	Sines	5.1
16	Mersin	4.8
17	La Spezia	2.7
18	Gioia Tauro	0.0
19	Istanbul	0.0
20	Izmit	0.0

Appendix

See Fig. 10.

Top 20 ports handling containers, 2008-2018
(thousand TEUs)

Rank 2018	Port	*	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017		2018		Change 2018/2017 (%)	
			Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	of which empty	Total	of which empty	Total	of which empty
1	Rotterdam (NL)	=	10 631	9 579	11 017	11 340	11 418	11 021	11 634	11 577	11 675	12 892	2 485	**13 598**	**2 635**	**5.5**	**6.0**
2	Antwerpen (BE)	=	8 379	7 014	8 144	8 317	8 174	8 256	8 812	9 370	9 891	10 032	1 495	**10 830**	**1 560**	**7.9**	**4.4**
3	Hamburg (DE)	=	9 767	7 031	7 906	9 035	8 891	9 302	9 775	8 848	8 929	8 860	1 191	**8 741**	**1 104**	**-1.3**	**-7.3**
4	Bremerhaven (DE)	=	5 451	4 552	4 858	5 911	6 111	5 822	5 731	5 467	5 510	5 458	858	**5 442**	**729**	**-0.3**	**-15.0**
5	Valencia (ES)	=	3 606	3 654	4 211	4 332	4 471	4 328	4 407	4 609	4 693	4 814	1 050	**5 169**	**1 211**	**7.4**	**15.3**
6	Piraeus (EL)	+2	437	667	850	1 681	2 815	3 199	3 493	3 360	3 736	4 120	805	**4 886**	**1 070**	**18.6**	**32.9**
7	Algeciras (ES)	-1	3 291	2 947	2 773	3 593	4 113	3 988	4 555	4 516	4 762	4 381	646	**4 773**	**770**	**9.0**	**19.2**
8	Gioia Tauro (IT)	+1	3 165	2 725	3 897	3 307	3 725	3 652	3 708	3 030	3 796	3 391	311	**4 005**	**347**	**18.1**	**11.5**
9	Felixstowe (UK)	-2	3 131	3 021	3 415	3 249	3 368	3 434	4 072	4 043	4 016	4 160	1 172	**3 781**	**985**	**-9.1**	**-16.0**
10	Barcelona (ES)	+1	2 567	1 846	1 928	2 006	1 745	1 717	2 056	1 950	2 225	2 998	756	**3 422**	**767**	**14.2**	**1.4**
11	Ambarli (TR)	-1	:	:	2 464	2 625	3 024	3 318	3 445	3 062	2 781	3 123	718	**3 170**	**685**	**1.5**	**-4.6**
12	Le Havre (FR) (¹)	=	2 512	2 257	2 369	2 222	1 997	2 186	2 433	2 560	2 480	2 799	460	**2 866**	**467**	**2.4**	**1.6**
13	Genova (IT)	=	1 462	1 311	1 020	1 277	1 578	1 546	2 014	2 079	2 356	2 332	13	**2 554**	**29**	**9.5**	**115.5**
14	Southampton (UK)	=	1 617	1 385	1 567	1 591	1 489	1 489	1 894	1 956	2 040	2 008	541	**1 970**	**562**	**-1.9**	**3.9**
15	Sines (PT)	=	220	253	382	447	553	931	1 228	1 332	1 513	1 669	131	**1 750**	**151**	**4.9**	**15.2**
16	Gdansk (PL)	+2	183	233	510	685	933	1 189	1 232	1 041	1 559	1 473	255	**1 736**	**315**	**17.8**	**23.4**
17	London (UK)	+2	983	646	733	737	687	944	1 059	1 185	1 492	1 375	459	**1 680**	**417**	**22.2**	**-9.3**
18	Mersin (TR)	-1	:	:	1 016	1 127	1 251	1 367	1 484	1 428	1 406	1 554	338	**1 662**	**379**	**7.0**	**12.3**
19	La Spezia (IT)	-3	1 186	840	1 181	1 205	1 181	1 207	1 262	1 579	1 605	1 612	93	**1 653**	**191**	**2.5**	**105.6**
20	Izmit (TR)	+1	:	:	416	508	630	808	899	989	1 143	1 316	236	**1 598**	**290**	**21.4**	**22.6**
Total top 20 ports (²)			**64 363**	**54 306**	**63 093**	**67 267**	**69 569**	**70 181**	**75 483**	**74 247**	**77 710**	**80 413**	**13 988**	**85 285**	**14 665**	**6.1**	**4.8**

(:) not available
Note: TEU: Twenty-foot Equivalent Unit (unit of volume equivalent to a 20 foot ISO container).
(*) column indicates number of positions lost or gained compared to 2017.
(¹) 2012-2013: partially estimated by Eurostat.
(²) Total figure for the ports being part of the top 20 ports of the countries reporting data during the reference year concerned. Turkish ports are not included in 2008 and 2009.
Source: Eurostat (online data code: mar_mg_am_pvh)

eurostat

Fig. 10 Top 20 ports handling containers, 2008–2018 (thousand TEUs). *Source* Eurostat

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