

TRENDS IN ENVIRONMENTAL MANAGEMENT IN CRUISE SEAPORTS

Joanna KIZIELEWICZ¹, Katarzyna SKRZESZEWSKA², Magdalena WINIARSKA^{3*}

¹ Faculty of Management and Quality Science, Gdynia Maritime University; j.kizielewicz@wznj.umg.edu.pl,
ORCID: 0000-0001-7415-9928

² Faculty of Management and Quality Science, Gdynia Maritime University; k.skrzeszewska@wznj.umg.edu.pl,
ORCID: 0000-0002-2102-0313

³ Faculty of Management and Quality Science, Gdynia Maritime University; m.winiarska@au.umg.edu.pl,
ORCID: 0000-0003-4489-9437

* Correspondence author

Purpose: The main objective of the article is to identify and evaluate activities undertaken in the area of environmental management in selected sea cruise ports in Europe resulting from the dissatisfaction of local communities caused by environmental pollution by cruise shipping companies.

Design/methodology/approach: The article presents the findings of a research project that employed a triangulation approach, utilising three distinct methods: data mining, desk research, and case studies.

Findings: Public authorities, seaport authorities, and cruise travel organizers implement a diverse array of strategies to prevent environmental degradation and mitigate adverse impacts on their surroundings. These strategies encompass formal-legal frameworks, organizational and technical initiatives, substantial investments, and crucially, social measures. By integrating these multifaceted approaches, they aim to foster sustainable practices and enhance environmental stewardship within the cruise industry.

Research limitations/implications: The deliberate selection of popular cruise seaports in Southern Europe limits the scope of the study, as it does not encompass a broader range of seaports.

Originality/value: The findings of this research could serve as a valuable resource not only for seaport authorities but also for local governments of coastal cities and cruise ship operators. Additionally, the article highlights various technological innovations employed in seaports to mitigate the detrimental environmental impacts of port activities.

Keywords: environmental management; seaports; cruise ships.

Category of the paper: Case study, literature review.

1. Introduction

Taking into account the growing dissatisfaction of the inhabitants of coastal tourist destinations from the fact that numerous giant cruise ships are handled in the seaports. As a result, seaport authorities are facing new challenges to develop a policy in which the interests of different groups are reconciled, On the one hand, cruise ship owners and entities involved in the service of tourists with the interests of local communities and local governments. The solution may be the introduction of environmental management in the context of micro, macro, and meso where the micro approach refers to actions that port authorities should take within the organization in the field of pro-ecological investments, an adaptation of procedures, certification, and accreditation of environmental management systems; on a macro scale in order to build an understanding with the immediate environment, i.e. residents and business entities and local governments in the port city, and on a meso scale, to respect international regulations and to join the European network of seaports that comply with environmental systems and standards (*EMS, ISO 14001, PERS, EMAS, SEM Code* etc.).

The activities of seaports are of great importance for the state of the natural environment, especially in the field of reducing greenhouse gas emissions, increasing energy efficiency, and using renewable energy sources. In this context, seaport authorities are currently facing enormous challenges imposed on them by various national and international institutions on the one hand, and other stakeholders on the other, including the local community of coastal tourist destinations and local authorities of coastal cities on the other. The main objective of the article is to identify and evaluate activities undertaken in the area of environmental management in selected sea cruise ports in Europe resulting from the dissatisfaction of local communities caused by environmental pollution by cruise shipping companies. In addition, three main research questions were posed, i.e.: 1) What factors determine the activities of seaport authorities in Europe in the area of environmental management? 2) What are the environmental management systems and models that take into account the specificity of port operations? 3) What environmental management measures are being taken by seaport authorities in Europe?

The findings of this research could be highly valuable not only for seaport authorities but also for local governments of coastal cities and cruise ship operators. The article also showcases various technological innovations implemented in seaports to reduce the negative environmental impacts of port activities. Additionally, it highlights several technological solutions aimed at enhancing energy efficiency and monitoring pollution in the analyzed seaports. The importance of legal regulations and international conventions relating to the issue of environmental management in seaports was also discussed and the need to develop relationships and multi-level cooperation between port authorities and the environment for sustainable development.

2. Literature review

2.1. Environmental management in seaports resulting from legal provisions imposed on seaports

Environmental management is "a part of an organization's management system, used to develop and implement its environmental policy and manage its environmental aspects" (ISO 14001:2004). Zurlini et al., (2008) define environmental management as "the factual policy and practice decisions and practices concerning how resources and the environment are assessed, protected, allocated, managed, used, reclaimed, reclaimed, and restored".

Dramatic climate changes caused by environmental pollution in recent years, as well as strong pressures from various interest groups on seaport authorities to reduce the harmful impact of port activities on the environment, compel port authorities to engage in dialogue and cooperation with various stakeholders.

The actions of seaports are determined by numerous factors, primarily legal, economic, social, technological, and environmental (Figure 1). Strong pressure from both local communities and international institutions to diminish the adverse environmental effects of economic activities will compel seaport authorities to take action by implementing new technological solutions and collaborating with diverse communities.

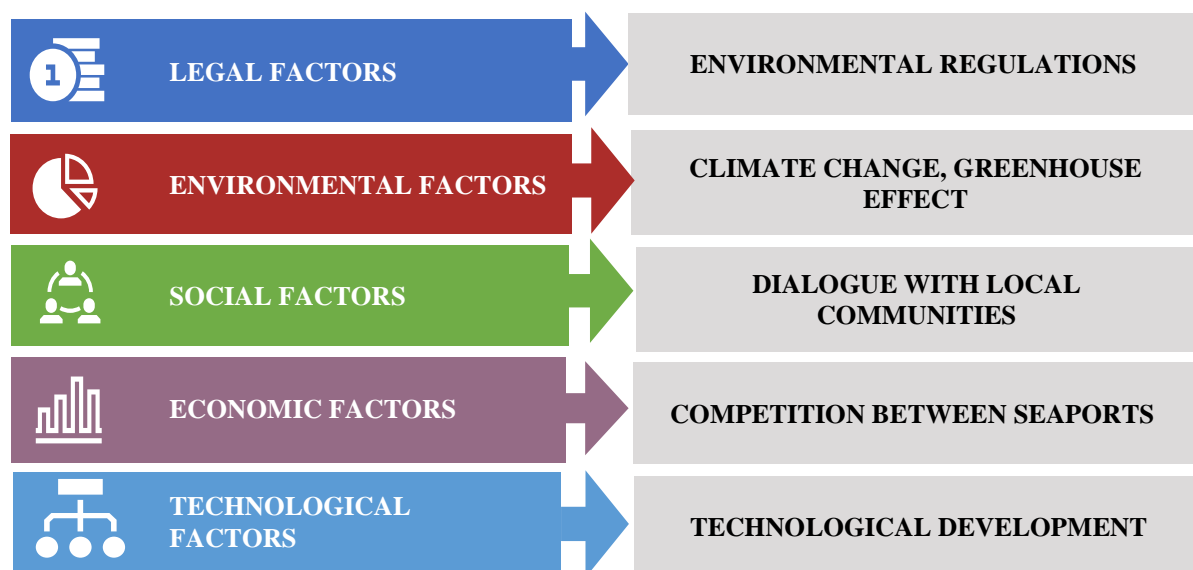


Figure 1. Factors influencing environmental management strategies in cruise seaports.

Source: Author's own elaboration.

Among the numerous factors influencing the decisions of seaport authorities, legal frameworks should be regarded as paramount for fostering investment and collaboration with entities. The extent of influence of legal regulations governing the operations of economic entities regarding the utilization and impact on the natural environment is determined by the authority responsible for formulating such laws.

The provisions contained in conventions adopted by the United Nations (UN) have the widest scope. The global scope of influence of this institution and its agencies gives direction to the actions of states and, through national law, to entities registered in them, including seaports.

In the field of protection of the marine natural environment, conventions, and strategic goals set by the UN, the implementation of which is also the responsibility of seaports, are included in universal provisions, for example in General Assembly Resolution A/RES/70/1: Transforming our world: the 2030 Agenda for Sustainable Development (United Nations, 2015) containing 17 Sustainable Development Goals (SDG) and regulations closely related to the marine natural environment, for example:

- United Nations Convention on the Law of the Sea – UNCLOS (United Nations, 1982).
- Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter – London Convention, (United Nations, 1972).
- Convention on Biological Diversity – CBD Convention (United Nations, 1992).

The UN agency dedicated to the safety and protection of the marine environment and the economic activities conducted within this environment is the International Maritime Organization (IMO). The most important conventions prepared under the auspices of the IMO that have an impact on port operations include:

- International Convention for the Prevention of Pollution from Ships – MARPOL (International Maritime Organization, 1973).
- International Convention for the Control and Management of Ships' Ballast Water and Sediments – BWM Convention (International Maritime Organization, 2004).
- International Convention on the Control of Harmful Anti-fouling Systems on Ships – AFS Convention (International Maritime Organization, 2001).

The scope of obligations imposed on ports due to the state's ratification of a given convention is presented in Table 1.

The column relating to the 17 Sustainable Development Goals indicates the goals and tasks referred to in the Resolution, which concern, among others, the activities of seaports. Most areas related to the exploitation of seas and oceans are covered by the so-called Constitution of the Seas and Oceans. The remaining conventions refer to selected, detailed issues related to the safety of navigation and the safety of the marine environment. Their common feature is the need, or even obligation, for international cooperation, ship support, and waste management. Two conventions (London and CBD) mention the possibilities of ports conducting educational campaigns promoting environmentally friendly behaviour and raising society's awareness of issues related to the protection of the natural environment of marine waters.

Table 1.

Laws regulating the safety and protection of the marine environment and activities conducted in the marine environment on a global scale that affect port operations

Thematic scope	United Nations						
	UNCLOS	London Convention	SDG	CBD	IMO		
					MARPOL	BWM	AFS
Navigation safety	+						
Environmental Protection	+	+	14.1; 14.3; 14.6	+	+	+	+
Anti-pollution	+		14.2	+	+		
Port security	+						
International cooperation	+	+	14.a	+	+	+	+
Ensuring freedom of navigation	+						
Cooperation with other ports	+		17.17				
Ban on dumping waste		+					
Waste management collection and disposal (from ships)		+	14.3		+	+	
Waste management ballast water			14.3			+	
Control and inspections		+			+	+	+
Technical support for ships					+	+	+
Education and awareness raising (optional)		+	17.17	+			

Source: own study based on conventions.

On a slightly narrower scale, legal provisions are created taking into account the specificity of the sea areas to which they apply. These are regional marine protection programs developed under the United Nations Environment Program (UNEP). In Europe, these are:

- Convention on the Protection of the Marine Environment of the Baltic Sea Area (the Helsinki Convention) – HELCOM covering all Baltic Sea countries and the EU as a party to the convention aimed at preventing and removing the pollution of the Baltic Sea (HELCOM, 1992).
- Convention for the Protection of the Mediterranean Sea Against Pollution (Barcelona Convention) – signed by 22 countries of the Mediterranean basin, the aim of which is the sustainable management of marine resources (UNEP, 1976).

In the case of European ports, there are two regional maritime programs (conventions) dedicated, among others, to regulating the operation of ports and the ships and economic entities serviced there in the field of environmental protection at the regional level. These are intergovernmental agreements:

- Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention, 1992), covers 15 coastal states of the Atlantic Ocean (North), the North Sea, and Switzerland, the aim is to protect the marine environment (OSPAR Convention, 1992).
- The Bonn Agreement is a mechanism under which 10 countries, plus the EU as a party, cooperate to protect the North Sea from oil pollution and harmful substances (Bonn Agreement, 2019).

Within the European Union, many regulations have been developed dedicated to environmental protection, including the marine environment. However, the mere fact of a Member State's participation in the program does not force ports to take action, as is the case with international conventions ratified by the state. The most important programs ensuring sustainable management of natural resources, including marine ones, include the Marine Strategy Framework Directive (MSFD), Water Framework Directive (WFD), European Marine Networks (EMD), European Ecological Network Natura 2000, and LIFE Programme.

Due to the specific nature of some regions (separated in the EU space as macro-regions), the European Union has prepared political frameworks - strategies for joint, efficient problem-solving and better use of the region's potential related to natural conditions.

Due to the subject of the article, it is worth mentioning two macro-regions covering member states around sea areas: the EU Strategy for the Baltic Sea Region (which is a prototype for subsequent macro-regions) and the Strategy for the Adriatic Sea and the Ionian Sea. The solutions included in the strategies are not mandatory for ports. Nevertheless, some of them undertake pro-ecological activities – as important entities implementing the Sustainable Development Goals in the Baltic, Adriatic, and Ionian Sea (Table 2).

Table 2.

Areas of possible active role of ports in the EU strategy for selected macro-regions implementation

Areas of the active role of ports		EUSAIR ¹	EUSBSR ²
Protection of the marine environment (ecological technologies, monitoring of pollutant emissions, waste management)		+	+
Sustainable development of	Ports	+	
	Local communities		+
Cross-border cooperation of ports		+	+
Development of port infrastructure	Increasing accessibility	+	
	Modernization		+
Development of maritime tourism		+	
Promotion of R&D in the field of port activities		+	
Promoting maritime transport			+
Maritime safety (accident prevention)			+

Note. European Union Strategy for the Adriatic and Ionian Region, ² European Union Strategy for the Baltic Sea Region.

Source: Author's own elaboration on the base of the EU Strategy for the Adriatic and Ionian Sea Region, EU Strategy for the Baltic Sea Region.

Both strategies, as the basic goal for which they were developed, are to contribute to taking actions, also by ports, that will protect the environment of water areas and coastlines. Achieving this goal requires the cooperation of coastal states, hence the second point common to both strategies – cross-border cooperation of ports. The remaining points of both strategies are the result of the level of development of the countries constituting macro-regions, port infrastructure, and the most important directions of economic development for individual regions.

2.2. Environmental management in seaports resulting from decisions made by seaport managers

Environmental management in seaports results from several reasons: economic, legal, and social. Making an effort to adapt the organization and its processes to the requirements of the standards whose fulfillment results in obtaining a certificate is part of sustainable development activities. By implementing environmental management systems, ports can reduce operating costs (optimizing the organization of processes, improving operational efficiency) and improve economic results thanks to greater trust of stakeholders (e.g. banks, and insurance institutions). Environmental management systems implemented in seaports include systems based on universal solutions and systems created specifically for ports as implementing entities (Figure 2).

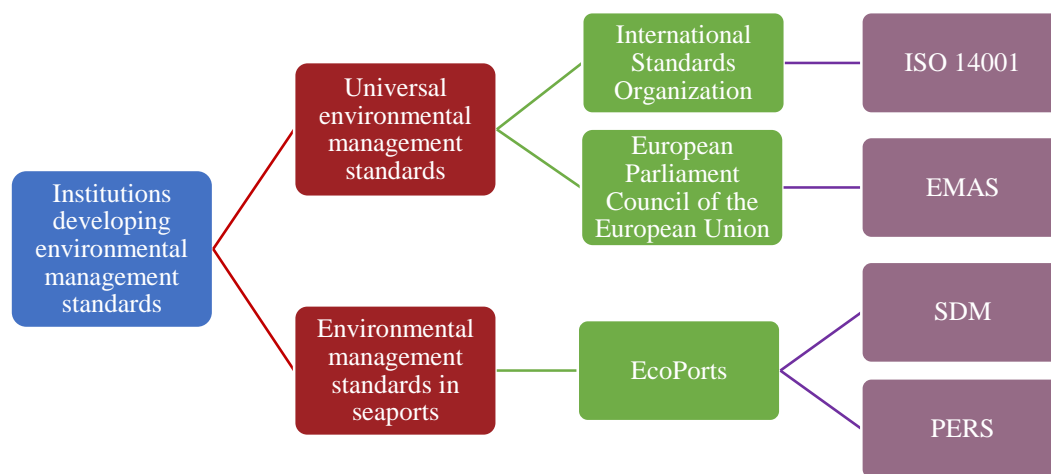


Figure 2. Environmental management systems implemented in seaports taking into account the institution of the organization defining the conditions of implementation and certification.

Source: Author's own elaboration.

The ISO 14001 standard is a framework for an Environmental Management System based on a process approach. The standard does not contain categorical requirements for the effects of environmental activities, but only specifications and guidelines for the use of the system. It was prepared to support the activities of enterprises and institutions in the field of environmental protection. In the case of ports, implementation of the standard means identifying areas of activity that have an impact on the environment, assessing environmental threats and risks, defining environmental protection activities to minimize the negative impact on the environment, and ongoing monitoring. The essence of the environmental management system is the permanent improvement of activities related to environmental protection.

ISO 14001 refers to the requirements of EMAS (Eco-Management and Audit Scheme) developed and adopted by the European Parliament in 1993, initially only for industrial enterprises, and after its amendment in 2001 also for non-industrial organizations (Peris-Mora et al., 2005; European Parliament and of the Council, 2009). It is the most important instrument for implementing the environmental policy of the EU (formerly EC). Compared to the ISO 14001 standard, EMAS has a much more restrictive approach to the implementation of the

environmental management system by entities belonging to the EMAS system: it requires compliance with applicable legal provisions in the field of environmental protection, an obligation to reduce the negative impact on the environment to the extent that is guaranteed use of the best available technique, determines the frequency of audits, obliges to prepare reports available to stakeholders (Erauskin-Tolosa et al., 2020; Testa et al., 2014).

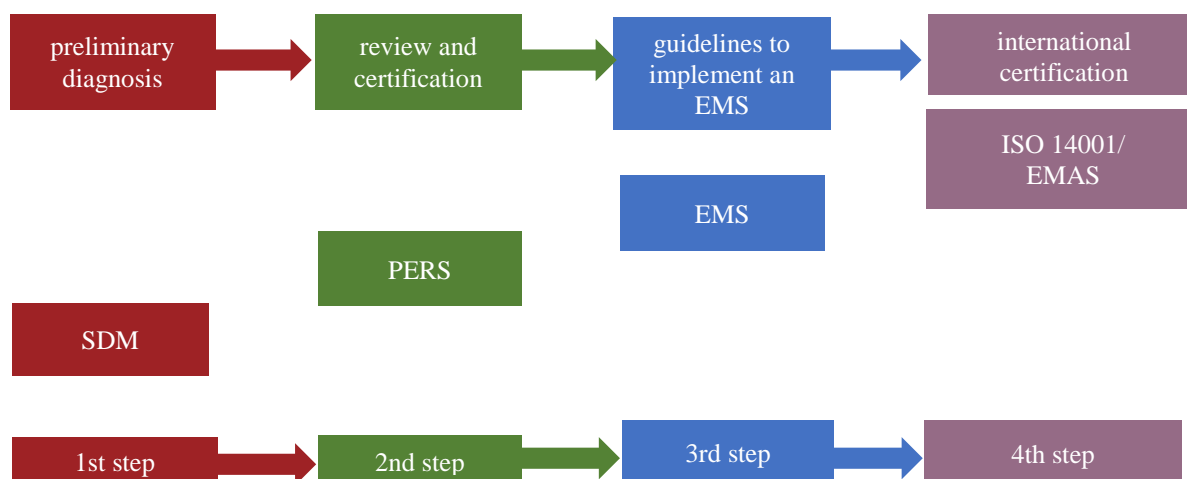


Figure 3. EcoPorts tools and International/EU environmental management standards.

Source: Darbra, 2004, pp. 420-428.

The higher requirements resulting from the implementation of the EMAS system do not bring marginal benefits to ports compared to the benefits resulting from the implementation of the ISO 14001 system. This is reflected in the number of ports with individual environmental management systems. Among the European ports belonging to the EcoPorts network, only nine have the EMAS certificate. These are: Igumenitsa in Greece and 8 Spanish ports: Valencia, La Coruna, Barcelona, Vigo, Cartagena, Algeciras, Ceuta, Bilbao. There are currently 53 ISO 1400-certified ports (EcoPorts, 2024).

Environmental management systems are also developed by port organizations. The specific nature of the activities of these complex business entities is then taken into account. The main pro-environmental initiative in European ports is the EcoPorts network – a non-profit organization that has created a platform connecting ports for 'information exchange and impact assessment for enhanced environmentally conscious operations in European ports and terminals' (Wooldridge, 2017). Since 2011 operates within the structures of the European Seaports Organization (ESPO). EcoPorts provides two tools for implementing and monitoring the functioning of environmental management systems: Self Diagnosis Method (SDM) and the Port Environmental Review System (PERS) (Figure 3).

SDM is an online tool that allows you to identify threats to the marine environment conduct a comparative analysis of the results for a given port with the European average and obtain expert recommendations on further steps. Port Environmental Review System (PERS) – this is an environmental management system dedicated to seaports. The standard applies to all key tasks assigned to seaports in the field of environmental protection: waste management,

emission management, water management, energy efficiency, and protection of the marine environment. Currently, 35 ports associated with ESPO have the PERS certificate. Dedicated tools for preparing and implementing environmental management systems in ports are an introduction to the implementation of universal environmental management systems ISO 14001 or EMAS (EcoPorts, 2024).

3. Research methodology

For the purpose of this article, a thorough query of available literature was performed. The article contains the results of the research carried out by using triangulation of several methods, i.e.: data mining method, desk research method, and case studies. The three most popular cruise seaports in the Mediterranean Sea were analyzed, i.e.: the Port of Venice, the Port of Dubrovnik, and the Port of Barcelona. Numerous law regulations issued by the international institutions, reports published by cruising organizations, strategies and reports developed by the seaports, as well as research papers were used in the studies and analysis. A descriptive, comparative and critical analysis were carried out. and the results of the analysis were presented in the form of tables and figures to illustrate the analyzed phenomena.

3.1. Environmental management standards and systems in cruise seaports – case studies

CLIA (2022) reports that in 2027, the number of cruise ship travelers will reach 39.5 million. An estimated 218 cruise ships operating in Europe emitted 509 tons of Sulphur oxides in 2022 (Elton, 2023) and 45 ships are responsible for pollution that compares to almost 10 times worse than pollution from 93,000 cars (Ensor, 2023). Among the most polluted cruise seaports in Europe are: 1) Barcelona (Spain), 2) Civitavecchia (Italy), 3) Piraeus (Greece), Palma Mallorca (Spain), Lisbon (Portugal), Hamburg (Germany), Southampton (UK), Mykonos (Greece), Thira (Greece) and Funchal (Portugal).

Thanks to the measures taken by the city authorities in consultation with the port authorities, Venice moved up from first place in 2019 to 41st place in the ranking of the most polluted cruise seaports (Ensor, 2023). Venice is ISO 14001 certified, which proves that it adheres to the highest standards in terms of caring for the natural environment (Table 3).

Table 3.

Environmental Management Standards and Systems in Cruise Seaports in the Mediterranean

Name of the cruise seaport	SDM	PERS	EMAS	ISO14001
Port of Venice	-	-	+	+
Port of Dubrovnik	-	-	+	+
Port of Barcelona	-	-	+	+

Source: Author's own elaboration on the base of ZAL Port, 2024; Port Authority of Dubrovnik, 2022; The Port of Venice, 2024.

The port authority also assures that since 2021 a permanent monitoring network for noise control and management in port areas has been in place. Ultimately, they plan to create an acoustic map of the port showing noise pollution from ships moored in the port. In addition, they declare that monitoring of air quality is carried out in the seaport to present the level of air pollution. The port authorities also declare that sustainable development is a priority for them and they undertake some activities in the field of: "energy efficiency improvements, electrification of docks, electric mobility and the promotion of LNG and hydrogen" (The Port of Venice, 2024).

The Port of Barcelona, as mentioned above, is considered as the most polluted port in Europe, has also implemented an environmental management system and respects the requirements of the ISO 14001 standard (Table 3). The port authorities prioritize environmental protection, increasing energy efficiency through the use of renewable energy sources and the introduction of new technologies (ZAL Port, 2024).

It should also be noted that the Port of Dubrovnik is ISO 14001 certified. In addition, the port authorities developed the document called *Plan for Reception and Handling of Waste in the Area Managed by the Port Authority of Dubrovnik* (Port Authority of Dubrovnik, 2022), which is a kind of guide to the handling of environmental management in the port. The port authorities take a very serious approach to environmental management. Which, as it was proved above, is manifested both in activities aimed at improving the natural environment and the quality of life of the city's residents.

3.2. Overview of actions in the scope of environmental management in cruise seaports – case studies

In the past, the Port of Venice (Italy) and in Barcelona (Spain) have been a model for other cruise seaports in the world. Passenger terminals were located in the centers of historic cities, which were a huge attraction for cruise ship travelers. Cruise ship owners sought the possibility of mooring cruise ships right in the city centers. Nevertheless, in recent years the situation has changed dramatically due to the huge pollution of the environment and the rapid development of mass tourism.

The city of Venice is an example of a cruise tourist destination, where the local community, together with NGOs, started a movement to reduce the negative effects caused by cruise ships and cruise travelers in the city and its surroundings. Venice struggles annually with a strong influx of masses of tourists from all over the world. Currently, The Port of Venice handles an average of more than 250 giant cruise ships per year (Figure 4), which bring more than 0,5 million travelers (Figure 5) (The Port of Venice, 2024). The situation changed after the COVID'19 pandemic, as in 2019 Venice was visited by 500 giant cruise ships, which brought more than 1.6 million cruise travelers.

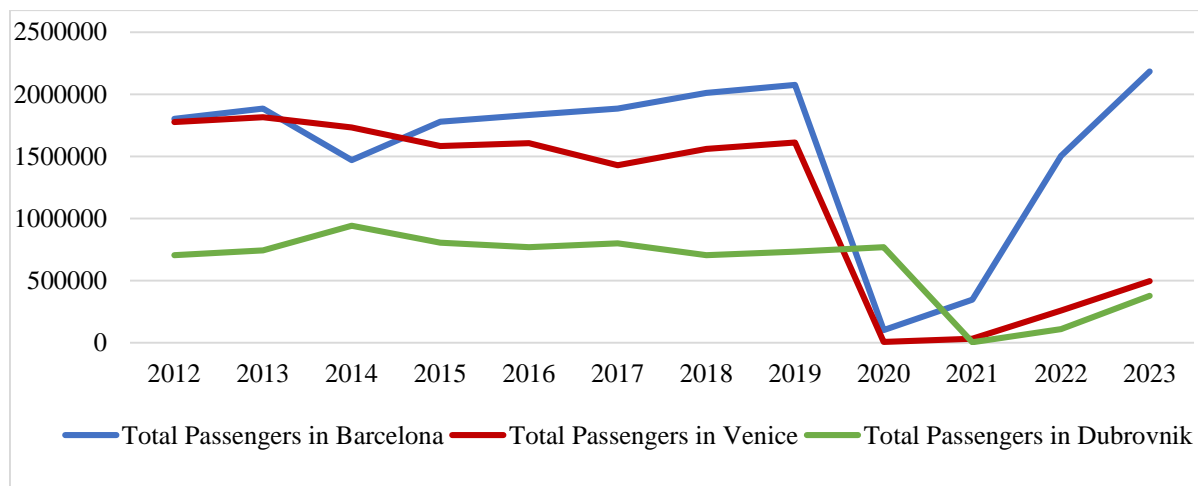


Figure 4. Number of cruise travellers in studied cruise seaports (2012-2023).

Source: Author's own elaboration on the base of ZAL Port, 2024; Port Authority of Dubrovnik, 2022; The Port of Venice, 2024.

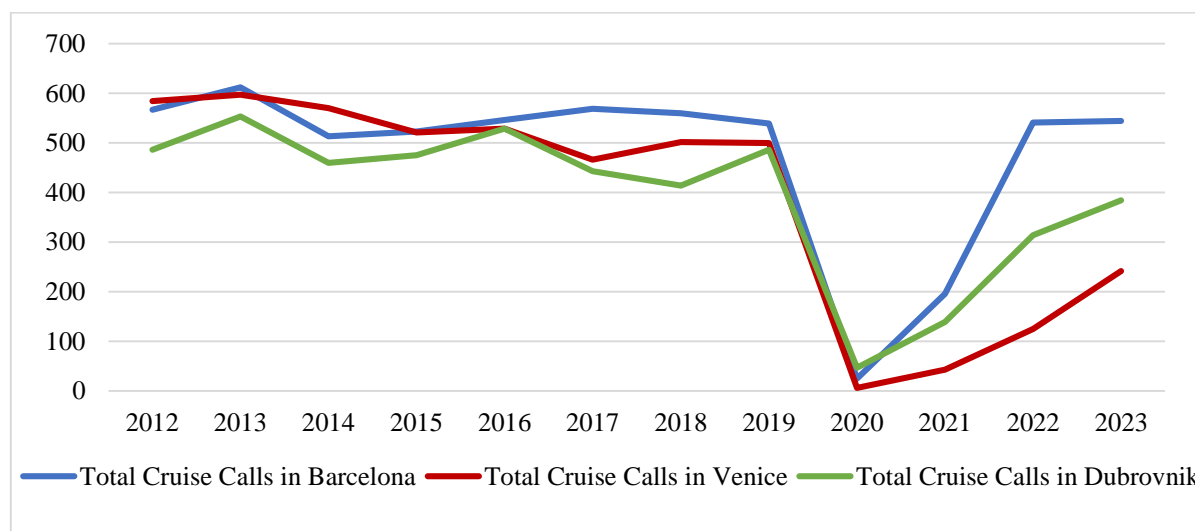


Figure 5. Number of cruise ships calls in studied cruise seaports (2012-2023).

Source: Author's own elaboration on the base of ZAL Port, 2024; Port Authority of Dubrovnik, 2022; The Port of Venice, 2024.

Venice becomes an unbearable city to live in. Local residents are moving to Mestre, selling off their apartments in the city center. The municipal authorities are afraid that Venice will lose its status as a city of World Cultural Heritage and will be removed from the UNESCO World Heritage List. Venice was considered for Europe's most polluted cruise seaport in 2019 (Elton, 2023). In order to meet the expectations of the local residents, the municipal authorities of Venice initiated a movement to reduce the negative impact of cruise ship traffic in the city. In 2007, an agreement on the Blue Flag of Venice was signed with the owners of cruise lines, which aimed to introduce standards for the use of fuel with lower Sulphur emissions. This was followed in 2013 by another Blue Flag II agreement, which required cruise ship owners moored at Venice berths to use only green fuel (Asero, Skonieczny, 2017). These activities brought measurable results and had an impact on the improvement of the

environment (Terranova et al., 2015). Another action taken by the authorities to reduce the negative impact of the cruising market on the city was the introduction of the Clini-Passer Decree 79/2012 of 2014 r. which introduced a restriction on the tonnage of vessels that may enter the Venetian lagoon, i.e. max do 40 000 GT. In 2017, a referendum organized by the *No Grande Navi association was held in Venice*, as a result of which 25,000 residents voted in favor of restricting ship traffic in the city, and the interest in participating in the referendum was much greater than the organizers expected, which may indicate the mood of the inhabitants (Terranova et al., 2015). An interesting study was carried out by the team of Bertocchi et al. (2020) presenting several scenarios to optimize tourist flows in the main tourist destinations of Venice in order to mitigate negative effects on the environment.

Other popular cruise tourist destinations, such as Dubrovnik (Croatia), are also following the example of Venice. The Port of Dubrovnik handles an average of more than 400 giant cruise ships per year (Figure 4), which bring about 0,7 million travelers (Figure 5) (Port Authority of Dubrovnik, 2024). UNESCO World Heritage List warned Dubrovnik of the possibility of losing its World Heritage status – *List of World Heritage in Danger*. In response to the emerging threat, the city authorities have introduced various solutions to reduce tourist traffic in the city. Cruise ships and coach operators must book their stops in Dubrovnik in advance. The city uses cameras to monitor and control this traffic. High fees have also been introduced for coach operators who arrive unannounced in the city center. In addition, cruise line operators are encouraged to stay longer and are offered discounts on port fees so that cruise travelers can purchase more goods and services in the city through a longer stay (Abbasian et al., 2020). In 2018, the cooperation between the Dubrovnik Port Authority and the Dubrovnik City Authority resulted in the introduction of a restriction that two cruise ships with 5,000 passengers on board can call at the port per day. In 2021, a system was introduced under the name the Digital Nomads-in-Residence (DN-I-R, 2021), which inform visitors how many cruise ships and tourists will be expected on certain days during the year.

The Port of Barcelona is another port that has followed the example of Venice and has taken action to promote environmental management. In 2022, the Port of Barcelona was ranked among the most polluted seaports. (Elton, 2023). The Port of Barcelona handles an average of more than 540 giant cruise ships per year (Figure 4), which bring more than 2 million travelers (Figure 5) (The Port of Barcelona, 2024). A few years ago, a modern passenger terminal, the World Trade Centre, was built in the center of the city, which could simultaneously handle several giant cruise ships. Climate change, pollution and disruption caused by hundreds of thousands of tourists arriving in Barcelona on cruise ships led to the fact that the seaport authorities, under pressure from the local community and local authorities, decided to close the terminal at the city's Muelle Barcelona Norte northern docks at the World Trade Centre in October 2023. As a result of this, almost 350 giant cruise ships per year have been diverted to the Moll d'Adossat pier south of the Catalonian capital, which is located a 30-minute shuttle bus ride from the city center. The port authorities also declare that in order to reduce the level

of pollutants emitted by ships during their stay in the seaport, they will implement an investment in electrifying the Adossat Quay for almost €80 million in 2024, and it will be equipped with shore power supply and LNG bunkering (CLIA, 2022a). The relocation of the terminal from the city center give opportunities for the development of space for public services for local residents.

The activities undertaken in cooperation between the Port of Barcelona and the local authorities was initiated by an agreement in 2018 and aimed at reducing the level of environmental pollution and reducing the negative impact of mass tourism on the environment. In addition, a daily limit of calls of giant cruise ships has been introduced to 7 vessels instead of 10 as it was before (Symons, 2023). In addition, the local authorities has taxed the hospitality industry and cruise ships, and now plans to introduce taxes on tour operators to increase travel costs for tourists to reduce their number.

Other cruise seaports in Europe are also following in the footsteps of the Port of Venice and Barcelona, which are struggling with overtourism and environmental pollution caused by giant cruise ships. Examples include Palma (Spain), Marseille (France), Santorini (Greece) and others.

4. Discussion

Environmental management in cruise seaports, as mentioned above, pertains not only to monitoring pollution levels in port basins but should be considered in a broader context, encompassing social, legal, and economic aspects. In this perspective, they should be considered as a striving towards sustainable development of coastal areas. Numerous entities are involved in this process, including primarily cruise seaport authorities, local governments, residents of coastal destinations, non-governmental organizations, as well as economic entities involved in the development of cruising and cruise ship operators.

The residents in cruise tourist destinations complain about vibrations and noise caused by the engines of giant cruise ships moored at docks in the immediate vicinity of tourist destination centers and historic parts of the cities. Cruise ships waiting for passengers who are exploring visited port cities during the day often wait with their ship engines running for up to 10-12 hours to power all the devices on board, consuming huge amounts of fuel and energy. The seaport authorities are blamed for problems related to pollution of port waters, air pollution, as well as congestion and overcrowding of seaside destinations due to the handling of even several giant cruise ships at the docks in ports. Additionally, the frustration of local communities in port destinations is exacerbated by the escalating, drastic climate changes caused by greenhouse gas emissions. To manifest their discontent with the actions, the local community along with non-governmental organizations protest against the movement of ships and demand dialogue and

the implementation of restrictions for shipowners. On the other hand, cruise ship operators and organizers conduct intensive campaigns promoting sustainable development of the cruising market (Figure 6).

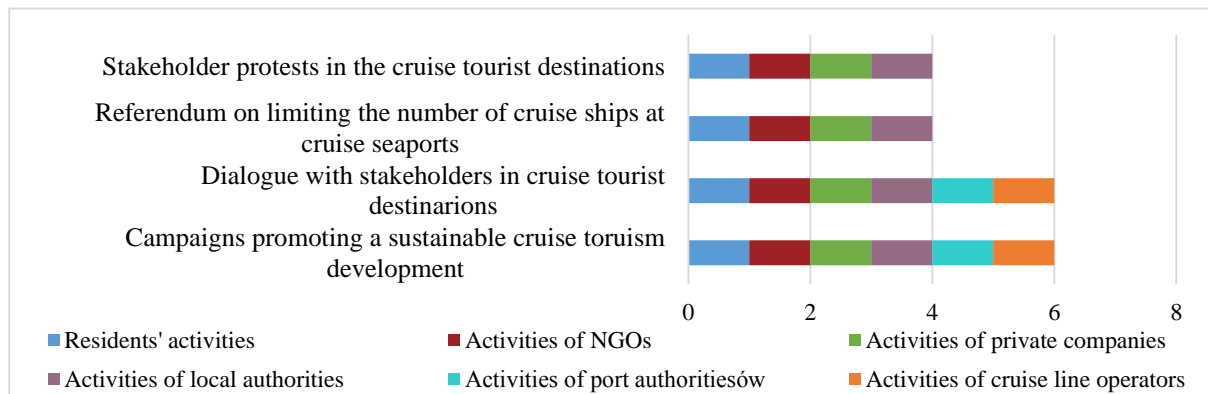


Figure 6. The actions of entities in cruise destinations in the scope of social dialogue for environmental management.

Source: Author's own elaboration.

Actions are also being taken to monitor cruise ship traffic, tourist movement in the city center, traffic congestion, as well as agreements are being made to jointly address issues related to excessive tourism and environmental pollution (Figure 7).

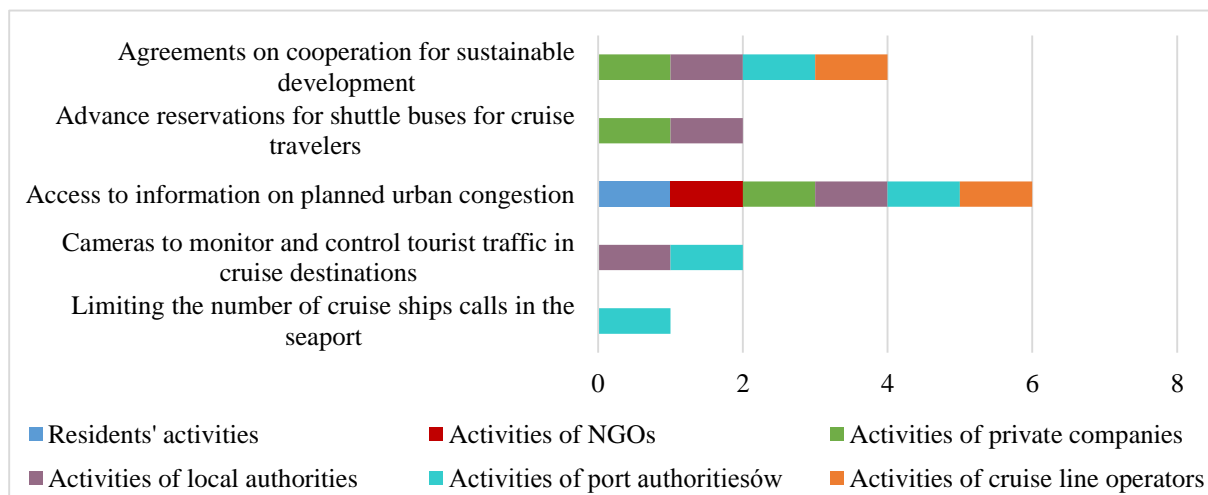


Figure 7. The actions of entities in cruise destinations regarding organizational solutions for environmental management.

Source: Author's own elaboration.

In response to various social movements and pressures from international organizations, entities involved in the development of the cruising market in cruise seaports are implementing a range of solutions aimed at minimizing the negative impact of the cruising market's development on the environment. An important aspect of environmental improvement efforts are legal restrictions imposing limits on cruise ship operators regarding the level of emissions of harmful substances into the environment during port stays, as well as limiting ship traffic in coastal destinations through various fees and taxes, as well as reservation systems.

Port fee discounts for cruise ships apply to vessels equipped with engines powered by liquefied natural gas (LNG) or compressed natural gas (CNG), or electric engines (Figure 8).

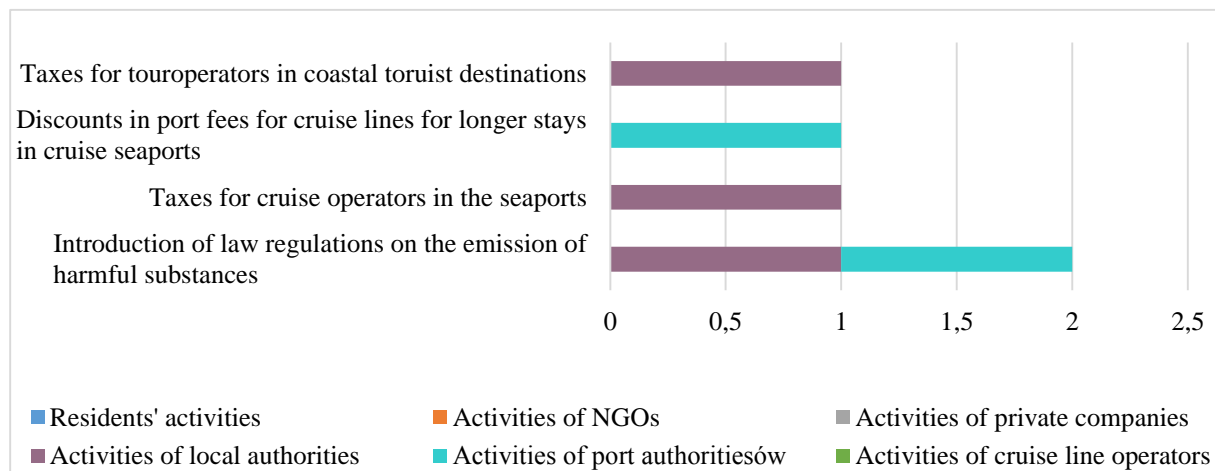


Figure 8. The actions of entities in cruise destinations regarding formal-legal solutions for environmental management.

Source: Author's own elaboration.

Even though electrically powered ships are quiet, clean, and efficient, their servicing in seaports requires costly infrastructure that would enable ships to be connected to onshore power supply. Such vessels can be powered by batteries, power generators, or alternative energy sources such as solar panels or wind turbines.

Port authorities, in collaboration with local government authorities, undertake investment actions to improve the state of the natural environment, particularly in terms of reducing the level of pollution emitted by ships moored at the docks (Figure 9).

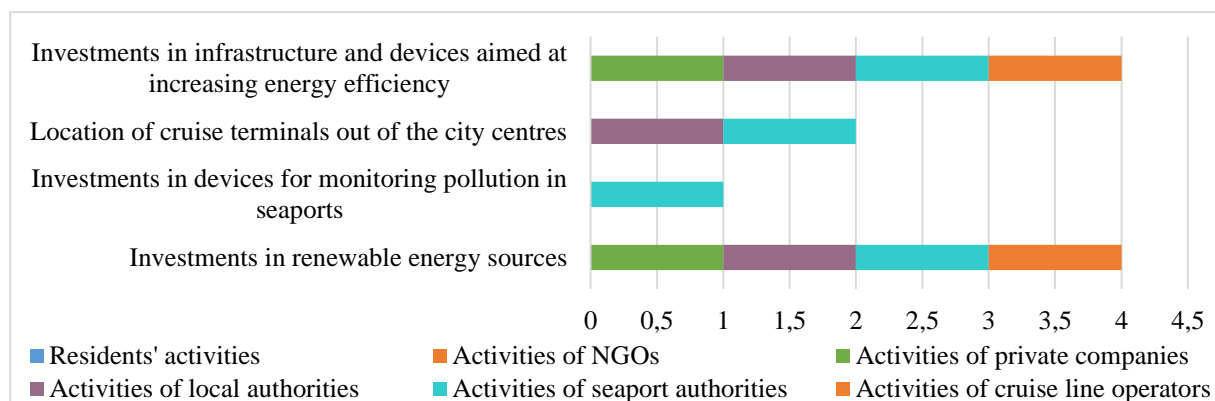


Figure 9. The actions of entities in cruise destinations in the area of investments for environmental management.

Source: Author's own elaboration.

Investments are being made in pollution monitoring systems (underwater sensors, monitoring software, underwater and aerial drones), infrastructure aimed at increasing energy efficiency (energy consumption monitoring systems, onshore power supply, marine shore power, solar panel installations, solar cell systems, LED lighting, hybrid energy recovery systems, automatic mooring systems, etc.) and investment in noise reduction (soundproof

windows, noise-reducing ramps for vehicles, etc.). The most important thing, however, is that, port authorities, in cooperation with local authorities, relocate passenger terminals outside city centers to alleviate tourist traffic and improve the quality of life for residents.

5. Conclusions

In summary, it must be noted that public authorities, seaport authorities, as well as cruise travels organizers, are aware of the risks associated with the development of cruise shipping for coastal tourist destinations. The conducted analysis demonstrates that they undertake a variety of actions in different fields to prevent environmental degradation and mitigate negative impacts on the surroundings. As demonstrated, they undertake actions in the areas of formal-legal solutions, organizational-technical initiatives, as well as investment, and most importantly, social measures. Among the most important trends in environmental management undertaken in cruise seaports, the following should be mentioned:

- In the SOCIAL AREA – collaboration and stakeholder engagement of various groups of interests in seaport areas for environmental management (regulatory agencies, city and seaport authorities, tourist companies, local residents, and environmental organizations etc.).
- In the ORGANIZATIONAL AREA – the development of alternative tourism offerings in destination areas to reduce overcrowding and ensure adequate experiences for visitors, as well as the development of the tourism market as part of a broader tourism destination management system, including aspects such as transportation and mobility, public space preservation, local economy, and housing.
- In the ECONOMIC AREA – sustainable and eco-friendly infrastructure and facilities in the seaports (renewable energy sources, onshore power supply, monitoring systems to track energy efficiency, air and water quality, water reuse systems, and waste management systems, etc.) and also the location of cruise passenger terminals outside the city centers.
- In the FORMAL-LEGAL AREA – introducing new or modified fee regulations for cruise ships in seaports, taxation of tour operators and tourists in coastal areas, and promoting cruise tourist destinations through lower taxes and local fees that attract higher-spending travelers with less environmental impact.

The conducted analysis has shown that all surveyed ports, i.e.: the Port of Venice, the Port of Dubrovnik, and the Port of Barcelona, are certified with the internationally recognized ISO 14001 certificates for environmental management systems (EMS). This indicates that the authorities of the surveyed ports adhere to guidelines and principles of sustainable development. They set goals and establish policies for development aimed at

minimizing the negative impact of economic activities on the natural environment and surroundings.

6. Limitations and recommendations

The article presented actions undertaken in the field of environmental management by only a few of the most popular cruise seaports in Southern Europe. The selection of the analyzed cases was deliberate, and it would certainly be worthwhile to analyze other seaports, especially in Northern Europe, which are leaders in implementing eco-friendly solutions for renewable energy sources and onshore power supply systems. Supplementing the research with additional case studies and preparing a map of solutions used in various cruise destinations would allow for the creation of a catalog of recommendations that could be useful for others stakeholders in cruise destinations. In addition to the analyses conducted in this article, it would be worthwhile to conduct a diagnostic survey with various stakeholders in cruise destinations to assess their attitudes and approaches towards environmental management. The results of the surveys could have significant value for addressing issues related to environmental management.

References

1. Abbasian, S., Onn, G., Arnautovic, D., Pulido-Fernández, J.I. (2020). Overtourism in Dubrovnik in the eyes of local tourism employees: A qualitative study. *Cogent Social Sciences*, 6(1). Retrieved from: <https://doi.org/10.1080/23311886.2020.1775944>, 10.02.2024.
2. Asero, V., Skonieczny, S. (2018). Cruise Tourism and Sustainability in the Mediterranean. Destination Venice. *InTech*, pp. 93-106. Retrieved from: <https://doi.org/10.5772/intechopen.71459>, 10.02.2024.
3. Bertocchi, D., Camatti, N., Giove, S., van der Borg, J. (2020). Venice and Overtourism: Simulating Sustainable Development Scenarios through a Tourism Carrying Capacity Model. *Sustainability*, 12(512). Retrieved from: <https://doi.org/10.3390/su12020512>, 10.02.2024.
4. Bonn Agreement (2019). *Agreement for Cooperation in Dealing with Pollution of the North Sea by Oil*. Retrieved from: <https://www.bonnagreement.org/>, 10.02.2024.
5. CLIA (2022a). Trends and perspectives in the Euromed cruise tourism. A research report, First edition. *Riposte Turismo*. Retrieved from: europe.cruising.org/wp-

- content/uploads/2022/07/RisposteTurismo_forCLIA_Trends_and-perspectives_-EuroMed_cruise_tourism_2022Ed.pdf, 10.12.2023.
6. CLIA (2022). *CLIA Passenger Data, 2019-2021, and CLIA Cruise forecast/Tourism Economics*. Retrieved from: <https://cruising.org/en-gb/news-and-research/research>, 10.12.2022.
 7. Darbra, R.M, Ronza, A., Casal, J., Stojanovic, T.A., Wooldridge, C. (2004). The Self Diagnosis Method. A new methodology to assess environmental management in seaports. *Marine Pollution Bulletin*, Vol. 48, pp. 420-428. Retrieved from: <https://doi.org/10.1016/j.marpolbul.2003.10.023>, 10.02.2024.
 8. DN-I-R (2021). *The Dubrovnik Digital Nomads-in-Residence*. Retrieved from: <https://saltwaternomads.com/events/dubrovnik-digital-nomads-in-residence/>, 10.12.2023.
 9. *EcoPorts Network*. Retrieved from: <https://www.ecoport.com/network>, 10.03.2024.
 10. Elton, Ch. (2023). *Air pollution: From Barcelona to Southampton, these are Europe's worst cruise ports*. Euronews.green. Retrieved from: <https://www.euronews.com/green/2023/06/19/air-pollution-from-barcelona-to-southampton-these-are-europes-worst-cruise-ports>, 10.02.2024.
 11. Ensor, J. (2023). *Cruise ship pollution, the top 10 worst ports in Europe*. EuroWeeklyNews. Retrieved from: <https://euroweeklynews.com/2023/06/16/cruise-ship-pollution-the-top-10-worst-ports-in-europe/>, 10.03.2024.
 12. Erasquin-Tolosa, A., Zubeltzu-Jaka, E., Heras-Saizarbitoria, I., Boiral, O. (2019). ISO 14001, EMAS and environmental performance: A meta-analysis. *Business Strategy and the Environment*, pp. 1-15. Retrieved from: <https://doi.org/10.1002/bse.2422>, 10.02.2024.
 13. *EU Strategy for the Adriatic and Ionian Region* (2014). Retrieved from: <https://www.adriatic-ionian.eu>, 22.03.2024.
 14. *EU Strategy for the Baltic Sea Region* (2009). Retrieved from: <https://www.eusbsr.eu/>, 22.03.2024.
 15. European Parliament and of the Council (2009). Regulation (EC) No 1221/2009 of 25 November 2009 on the voluntary participation by organizations in a Community eco-management and audit scheme (EMAS), repealing Regulation (EC) No761/2001 and Commission Decisions 2001/681/EC and 2006/193/EC. 2009. Retrieved from: <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32009R1221>, 10.02.2024.
 16. HELCOM (1992). *Convention on the Protection of the Marine Environment of the Baltic Sea Area*. Retrieved from: <https://helcom.fi/about-us/convention/>, 10.03.2024.
 17. International Maritime Organization (1973). *International Convention for the Prevention of Pollution from Ships*. Retrieved from: [https://www.imo.org/en/about/Conventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-\(MARPOL\).aspx](https://www.imo.org/en/about/Conventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx), 22.03.2024.

18. International Maritime Organization (2001). *International Convention on the Control of Harmful Anti-fouling Systems on Ships*. Retrieved from: [https://www.imo.org/en/About/Conventions/Pages/International-Convention-on-the-Control-of-Harmful-Anti-fouling-Systems-on-Ships-\(AFS\).aspx](https://www.imo.org/en/About/Conventions/Pages/International-Convention-on-the-Control-of-Harmful-Anti-fouling-Systems-on-Ships-(AFS).aspx), 22.03.2024.
19. International Maritime Organization (2004). *International Convention for the Control and Management of Ships' Ballast Water and Sediments*. Retrieved from: [https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Control-and-Management-of-Ships%27-Ballast-Water-and-Sediments-\(BWM\).aspx](https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Control-and-Management-of-Ships%27-Ballast-Water-and-Sediments-(BWM).aspx), 22.03.2024.
20. OSPAR Convention (1992). *Convention for the Protection of the Marine Environment of the North-East Atlantic*. Retrieved from: <https://www.ospar.org/convention>, 22.03.2024.
21. Peris-Mora, E., Diez Orejas, J.M., Subirats, A., Ibanez, S., Alvarez, P. (2005). Development of a system of indicators for sustainable port management. *Marine Pollution Bulletin* 50(12). Retrieved from: <https://doi:10.1016/j.marpolbul.2005.06.048>, 10.02.2024.
22. Port Authority of Dubrovnik (2022). *Plan For Reception and Handling of Waste in the Area Managed by the Port Authority of Dubrovnik*. Retrieved from: <https://www.portdubrovnik.hr/documents>, 10.03.2024.
23. Symons, A. (2023). *Cruise passengers in Barcelona will no longer be able to stop in the city centre*. Retrieved from: <https://www.euronews.com/travel/2023/10/13/cruise-passengers-in-barcelona-will-no-longer-be-able-to-stop-in-the-city-centre>, 10.02.2024.
24. Terranova, G., Citron, M., Parolin, A. (2015). *The Port of Venice case study: Voluntary agreements to reduce air pollution from cruise ships*. GreenPort Cruise Conference. Copenhagen.
25. Testa, F., Rizzi, F., Daddi, T., Gusmerotti, N.M., Frey, M., Iraldo, F. (2014). EMAS and ISO 14001: the differences in effectively improving environmental performance. *Journal of Cleaner Production*, Vol. 68, pp. 165-173, doi.org/10.1016/j.jclepro.2013.12.061
26. The Port of Venice (2024). *Monitoring*. Retrieved from: <https://www.port.venice.it/en/projects-and-sustainability/environmental-projects/monitoring>, 17.02.2024.
27. UNEP (1976). *Convention for the Protection of the Mediterranean Sea Against Pollution*. Retrieved from: <https://www.unep.org/unepmap/who-we-are/barcelona-convention-and-protocols>, 10.03.2024.
28. United Nations (1972). *Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter*. Retrieved from: <https://treaties.un.org/doc/publication/unts/volume%201046/volume-1046-i-15749-english.pdf>, 10.03.2024.
29. United Nations (1982). *United Nations Convention on the Law of the Sea*. Retrieved from: https://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf, 10.03.2024.
30. United Nations (1992). *Convention on Biological Diversity*. Retrieved from: <https://www.cbd.int/convention/text>, 10.03.2024.

31. United Nations (2015). *Transforming our world: the 2030 Agenda for Sustainable Development*. Retrieved from: <https://www.un.org/sustainabledevelopment/development-agenda/>, 10.03.2024.
32. Wooldridge, Ch., Journée, H., Whitehead, D., Joosten, K. *The Story of Ecoports. Building a Worldwide Network for Sharing Experience in Port Environmental Management*. Retrieved from: https://www.ecoport.com/assets/files/common/brochures/The_Story_of_EcoPorts-v8-with_pictures.pdf, 10.03.2024.
33. ZAL Port (2024). *Certificates of the ZAL Port of the Port of Barcelona*. Retrieved from: <https://zalport.com/en/our-values/certificates>, 17.02.2024.
34. Zurlini, G., Zaccarelli, N., Petrosillo, I., Kurt, R.H. (2008). Environmental security as related to scale mismatches of disturbance patterns in a panarchy of social-ecological landscapes. In: I. Petrosillo, F. Müller, K.B. Jones, G. Zurlini, K. Krauze, S. Victorov, B.L. Li, W.G. Kepner (Eds.), *Use of Landscape Sciences for the Assessment of Environmental Security* (pp. 383-398). NATO Science for Peace and Security Series C: Environmental Security. Dordrecht: Springer.