

# Adopting a Green Port Standard for World's Sustainability

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## Abstract

Environmental friendly port has become the current world concern. Today, ports around the world are voluntarily working to plan for the sustainability of our mother Earth. This paper will look into the overall port planning, green port growth and the current activities for maintaining a green port. There is one globally accepted system develop by EcoPorts that encourages individual ports to voluntarily join the community and commit to preserve the environment. At this juncture, it is best not to reinvent the new wheel but to adopt and then further improve the EcoPort SDM method and PERS certification that is already been globally accepted as green port standard.

**Key words:** environmental friendly, terminal standard, sustainability, green, green port, EcoPort, SDM, PERS

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## Introduction

A port is a maritime intermodal interface which facilitates for vessels to berth and anchor. It is also the area where there are equipment to transfer goods from the vessel to shore and from vessel to vessel (Alderton, 2008). Ports are usually governed by port authorities, an independent body with juridical status to monitor the functioning of a port according to the rules as defined in the constitution.

In the past, port authorities were more concerned about the impact of the environment towards the port activities. Sea waves, winds, tides and currents were monitored and controlled critically as it will impact greatly on the navigations and quayside procedures. Dredging too is carried out regularly to ensure that the draft will be deep enough for vessels to manoeuvre. The port authorities were not bothered about the impact of port operations towards the environment.

Today, the scenario is changing fast. As the world's environment health is deteriorating, people and port authorities are taking steps to promote more on the green behaviour. The green culture is based on the concept that people should act to promote sustainability of the world. It is further enhanced with the adoption of environmental management system (EMS) which further promote compliance with legislation and environment protection to the highest practicable standard (Woolridge, 2017). The system also evolved over time to also include protection of ecosystem and habitats which is control by risk matrix. Green adaptation too has expanded to multiple ports, hinterland and all the logistics activities.

This paper calls to adopt a sustainable green port standard that will be used in all ports in this world. The need is increasing day by day, thus it will be the source of reference to the future researchers.

## Port Green Growth

The sea mode still leads as the preferred mode of transportation. Today more than 80% of the international trade were moved by sea which further emphasizes the importance of ports (Bichou, 2009). In relation to that, Badurina *et al* (2017) reported that shipping is responsible for approximately 20% of global discharges of wastes and residues into the sea.

Ports around the world have begun to toy the new concept of sustainable “Green Growth”. The green growth movement focuses on new innovation to reduce carbon emission at all business location inside the port (Vellinga, 2011). Embracing the green movement will actually benefit the port and port authorities as green is normally associated with efficiency of using the energy. The benefit can further improve all economics and operational activities, as well as reducing operating cost in short and long run for the participating ports.

Port Authorities around the world is now actively promoting green development of seaports. For instance, the Johor Port Authority in 2015 has develop a comprehensive “Green Port Policy” for the ports under its jurisdictions. The Indian government in 2017 has launched the “Project Green” while the European Union has gazetted the “green” development of seaport. There are many other instances, and is listed in **Appendix 1**.

### Overview of Studies on Green Port

Ports are growing all these while. Until today, there is no official number of ports and terminals in the world as some may be publicly owned while some others are privately operated. Bichou (2009) estimated that there are some 30,000 ports and terminal in the world. Ports grow rapidly together with the growth of world trade. In a report produced by Llyods (2016) showed that the top 50 ports in the world control approximately 67% of the container volume. The problem arises when the port becomes bigger, then we can expect bigger discharge of pollution. Seaports are known to be the main contributor of anthropogenic environmental pollution via the activities of maritime transport. This is huge challenge for port managers to plan for environmental protections (Luo, 2013).

Pollutions derived from port activities are diverse. This is mainly due to the fact that the port itself has diverse activities like bunkering, warehousing, port logistics and trucking activities. The more volume that the port handle, we can easily anticipate higher CO2 emission discharge. **Table 1** below shows a period of time environmental survey of the port manager’s priority in handling environmental issues. It is noted that the priorities changes over time with the dredging operation concerns dominates the early studies while the recent one is centred on air and water quality. The 2016 study actually reflects the changing awareness of the port workers who is more health conscious than the years before.

**Table 1** Environmental Survey Priorities in the European Port Sector (1996-2016)

	1996	2004	2009	2013	2016
1	Port development (water)	Port waste	Noise	Air quality	Relationship with local community
2	Quality of water	Dredging operations	Air quality	Port waste	Air quality
3	Dredging	Dredging operations	Seaport waste	Energy consumption	Water quality
4	Dredging operations	Dust	Dredging operations	Noise	Port development – landside
5	Dust	Noise	Dredging operations	Waste from the ship	Port waste
6	Port development – landside	Air quality	Relations with the local community	Relations with the local community	Soil contamination
7	Landside pollution	Danger cargo	Energy use	Dredging operations	Hazardous cargo
8	Habitat degradation	Storage	Dust	Dust	Noise
9	Amount of traffic	Port development – landside	Port development – water	Port development – landside	Energy consumption
10	Industrial wastewater	Discharge of ship’s bilges	Port development – landside	Quality of water	Ship waste

Adopted from: New environmental performance baseline for inland ports: A benchmark for the European inland port sector (Segui *et al*, 2015)

To achieve a green port status, ports and port authorities are initiating new projects for energy production and reduction of CO<sub>2</sub> (Badurina, 2017). Some of the works include using solar energy, converting to e-RTG from diesel operated unit, planting trees and also adopting EMS 14001: 2015 standards.

## **Evidence of Port Environmental Protection Actions**

Since early 1980s, the environmental protection has become the subject of great importance to the port community. The World Commission on Environment and Development in *Brundtland Report (1986)* has defined sustainable development as to balance the present human needs without compromising the future human generations to meet their own needs (Borowy, 2014). The definition eventually implies that there are limits to environmental resources and also the controlling the human greed in mining the limited world's resources.

Nevertheless, we need to understand that the port is not actually responsible to ensure that sustainability is adhered. It is a voluntary process of each individual port. In fact, the environmental considerations can be different for each port and subject to their own preferential guidelines and the relationship with the port community; including the partners in logistics chain. In some cases, the sustainability program is categorized as corporate social responsibility of the port.

In meeting the sustainable development, the world body has lined up few international laws that have been used as the guidelines for environmental protections (UNCTAD, 2016). Among others include the following laws and conventions:-

- i) MARPOL Convention on the Prevention of Marine Pollution by Dumping of Wastes and "Other Matter". According to MARPOL 73/78 Convention, all discharge by ships into the sea are regulated which include oil, noxious liquid substances transported in bulk, harmful substance in packaged form, sewage from ships, garbage from ships and air pollution from ships.
- ii) International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC 1990)
- iii) Ballast water management (BWM 2004 Convention)
- iv) International Convention on the Control of Harmful Anti-fouling Systems on Ships

In addition to the above, there are many other international studies on port environmental protection done by international associations like PIANC (World Association for Waterborne Transport Infrastructure, formerly known as the Permanent International Association of Navigation Congresses) and IAPH (the International Association of Ports and Harbours). Amongst the numerous studies international or regional organizations that have published on the subject of port environmental protection, the commonly referred document included:-

- i) "Environmental Considerations for Port and Harbours" (Ecological questions to take into consideration in the management of the port and the port area), from the World Bank reference 126/190
- ii) "Assessment of the Environmental Impact of Port Development" GESAMP. This is the assessment finding report of the GESAMP/IMO seminar of September 1992.
- iii) "Sustainable Development in the Port Sector" (UNCTAD/SDD/PORT/1, 1993)
- iv) ESPO Environmental Code of Conduct 2003, which includes the 10 commandments in part I and a code of best practices in part III
- v) EcoPort: reports from a project sponsored by the EU for implementing environmental management tools, setting up benchmarking and databases, and networking for good practices. EcoPort philosophy will be used as the basis of this paper.

## **Types of port environment problem**

UNCTAD (2016) and Bichou (2009) in their official study have listed down the actual port discharges that contributed to the environmental deterioration. In total, there are four main source of port pollutions. The complete study can be identified in the following table:-

**Table 2** Pollution Sources and Possible Impact

No	Pollution Sources	Possible Impact
1	Pollution originating from ships	i) Dirty ballast water, water used for washing tanks and holds, bilge water and other domestic waste. ii) Ship discharge of hot water could prove to be harmful to aquatic life iii) Oil sludge disposal iv) Garbage disposal
2	Pollution from cargo handling	i) Air pollution ii) Climate change effects iii) Noise and vibration iv) Impact on adjacent residential and urban area v) Visual pollution
3	Pollution from port expansion	i) Construction and dredging will cost coastal erosion and subsidence ii) Land reclamation will degrade of estuaries, loss of habitat iii) Ships navigation will degrade water and air quality
4	Pollution from ships navigation	i) Degradation of water and air quality ii) Water pollution iii) Aesthetics and visual pollution

### Evidence of Progress in Port Environmental Programs

The European ports have been aggressive to promote environmental conservation programs. In a multi years study by ESPO (2012) and EcoPorts (Woolridge, 2017), we are able to derive to a documented evidence on the continuous monitoring of the pollution awareness.

**Table 3:** Progress in Environmental Awareness at Ports

Environmental Management Component	1996 (%)	2004 (%)	2009 (%)	2012 (%)
Does the port authority have an environmental policy?	45	58	72	91
Is the policy made available to the public?	-	59	62	82
Does the policy aim to improve environmental standards beyond those required under legislation?	32	49	58	72
Does the port publish an annual environmental review or report?	-	31	43	62
Does the port have designated environmental personal	55	67	69	95
Does the port have environmental management system?	-	21	48	62
Is environmental monitoring system carried out in the port?	53	65	77	80
Has the port identified environmental indicators to monitor trends in environmental performance?	-	48	60	71

Over the years we can summarize that the ports and the authorities have become more concern about the environment and future sustainability. For instance in 2012, 91% of the port surveyed has documental environmental policy if compared to only 45% in 1996. We can also see that 95% of the port surveyed have a designated environmental personal in 2012 if compared to only 55% in 1996. All the other elements that were studied on port environment issues too shows positive signs with regards to the increasing awareness and activities that lead to a better control of the environment

### Overview of Activities to Promote on Green Port

As the world trade increase, ports will also continue to grow. Ports too will continue to produce environmental wastes. At this point of time, we can safely assured that majority of port authorities are

looking into the possible controls to promote green port. **Table 4** below is a summary of the activities that is evident today across the continents.

**Table 4:** Global Activities to Promote Green Port

No	Continent	Notable Actions
1	Europe	Aggressive to promote Self Diagnosis Method (SDM). This is a voluntary process to allow ports to study about the own port policy towards environmental. SDM is actually the key to become a PERS Certified Port  PERS is the only port sector specific environmental management standard which is developed by the port for the port to use. Today PERS is available across the globe via ECO Sustainable logistics Chain Foundation (ECOSLC)
2	USA	USA Environmental Protection Agency (EPA) Ports Initiative works in collaboration with the port industry, communities, and all levels of government to improve environmental performance and increase economic prosperity. Two elements that's is measured include:- i) measuring air quality and GHG performance of ports ii) improving environmental performance as goods and passengers move through ports.
3	Asia	Asia-Pacific Economic Cooperation in 2016 has approved a paper to promote Green Port Award System (GPAS). The award is to given to ports who uses method to reduce pollutions at the port
4	Australia	There is no known direct incentive to the port sector but he Australia Government is promoting:- i) a 20 % Renewable Energy Target (RET). ii) energy efficiency incentives via the Australian Carbon Trust

### Established Standards to Qualify for Green Port Status

ISO 14001 and EMAS standard are the other two environmental management systems that ports can use to maintain sustainability standards in the respective ports. This is in addition to the Self Diagnosis Method (SDM) and the Port Environmental Review System (PERS) certifications. Recently ISO 20519 (safe bunkering of LNG ships) has been approved in 2017 to further add substance in the safe environmental port practice.

Below is a short review of the established system:-

*i) SDM and PERS*

Have been discussed through this paper

*ii) ISO 14001*

The ISO 14001 is a voluntary certification that any organization (not limited to port) can apply and implement. The standard specifies requirements for any organization to enable them to have a guideline on managing environmental management system in the organization (Yahya, 2016). Among other the standard requires an organization to develop and implement a policy and objectives which take into account legal and other requirements to which the organisation subscribes.

*iii) ISO 20519*

ISO 20519:2017 is a set requirements for LNG bunkering transfer systems and equipment used to bunker LNG fuelled vessels. Specifically, the requirement are complimentary to the IGC Code which did not spell five key elements which consist of the operational procedures, handling liquid and vapour system, requirement for the LNG provider to provide an LNG bunker delivery note, training and qualifications of personnel involved and also requirements for LNG facilities to meet applicable ISO standards and local codes. All the five elements must be spelled clearly to allow LNG fuelled vessel to bunker in a safe and sustainable way.

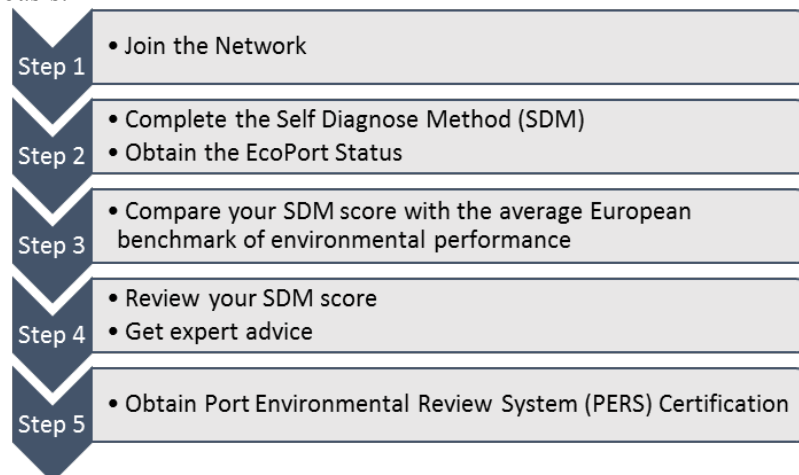
iv) *EMAS*

Since 1995, the EU Eco-Management and Audit Scheme (EMAS) has become an established management tool for companies and other organisations to document, evaluate and improve their environmental performance. The EMAS system is regulated by European Parliament and of the Council on voluntary participation. Bear in mind that the system is not the same with ISO certifications.

All the above management systems can be used to show prove of becoming green ports. However, both ISO14001 and EMAS system is a broad system that any organization can adopt. ISO 20519 on the other hand focuses only on the safe bunkering procedures at ports. Thus we are left with only the SDM and PERS system by EcoPorts to champion the port long term sustainability

### The Process to be PERS Certified

EcoPort tools started in Europe and promotes the voluntary SDM and PERS certification. As of today, the PERS Certification is the only international green port standards across the globe. The application to be PERS certified is gaining popularity but still not fully accepted since the process is on voluntary basis.



**Figure 1:** EcoPort Tools

The above **Figure 1** is the complete step to become a PERS Certified port. Applicant ports must register first under the SDM to obtain the EcoPort status. The SDM is the passport to become a PERS certified port.

In this process, there are 2 areas where we need further elaboration:-

i) *When preparing to submit the SDM (Step 2, Step 3 & Step 4)*

Applicant ports is required to work closely to maximize the SDM tools and benefits.

Among others is to:-

- Identify all applicant port related environmental risk. This is self-assessment of the applicant port current practices to understand and adopt the green port requirement
- Compare the applicant port SDM score with European port average. This is also a critical area to benchmark and know where the applicant port stand against the European port environmental average.
- Receive expert's advice and personalized recommendation. This is the personalized recommendation by the port experts to ensure that the applicant port will work towards a better environmental control and planning.

ii) *Obtaining the PERS Certification (Step 5)*

- The PERS is only valid for 2 years. Thus it is a motivation for the applicant port to work hard towards continuous PERS Certification. The PERS incorporates the general requirement of

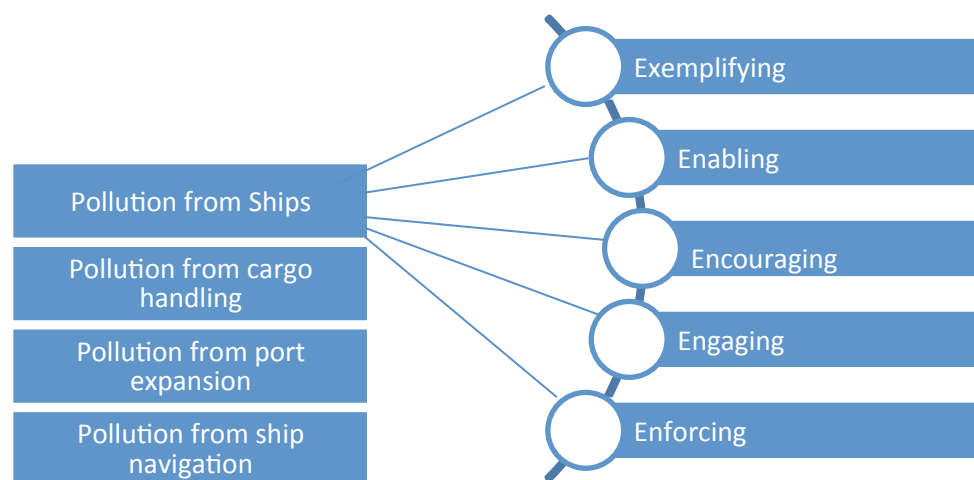
ISO14001 and also manages the peculiarity of each port. PERS builds upon the policy recommendations of ESPO that allow the ports to obtain a clear objective of environmental policy. PERS implementation is independently reviewed by Lloyd's Register.

To achieve the above certification, European port authorities focus the actions on the following ESPO recommended code of actions (ESPO, 2012). This code of actions is also commonly known as the **5E's Code**:-

- i) **Exemplifying**: *Showing good examples to the port community in managing effective environmental performance for each operations and assets*
- ii) **Enabling**: *Providing reliable port facilities to encourage port users to enhance environmental performance within the port site*
- iii) **Encouraging**: *Providing recognizable incentives to encourage port users to enhance their environmental participation*
- iv) **Engaging**: *Educating the port users/authorities with the skills that targets environmental improvement at port and logistics site*
- v) **Enforcing**: *Ensuring compliance by the port users for making use of the mechanism for good environmental practice*

### Theoretical Model of Implementation

Based on the criteria introduced by EcoPorts SDM and PERS, we should be looking at ways to encourage more participation of the port to build on sustainability. The proposed model would be able to address all the pollution sources. For instance, the figure below explains how pollution from a ship can be magnified from the using the ESPO code of actions



**Figure 2:** Blending the ESPO Code with Source of Pollution

We will use **Figure 2** as an example. In the case of *pollutions from the ship*, there will be five criteria that will encourage the port communities to be environmental friendly. For instance:-

- i) When using the **Exemplifying** code, the vessel should show the authorities how she manages her environmental performance. A good example is by having ISO14001 and also to appoint only ISO approved vendor for sludge management.
- ii) In the **Enabling** code, the port should provide basic facilities for the vessel to perform environmentally friendly procedure in the least cost possible. Vessels might not be interested if they

have to pay additional cost for being eco-friendly.

iii) The port might as well continue to **Encourage** vessels to be environmentally friendly by giving additional incentives to the vessels. The encouragement might not only be monetary, vessels can also be motivated by priority berthing, faster clearance etc.

iv) The **Engaging** session allows vessels operators to receive additional information and skills training to further reduce their discharging of ships pollution

v) Vessel may also **Enforced** to accept minimum environmental requirement as the compliance to qualify for any environmental incentives.

### Limitations of Observation

Most of the studies and reviews are derived from the European port data. This is because there is not much data that has been established on the Asian and African port environmental management program. It will be more appropriate for this paper to analyse published port data from ports across the globe.

### Conclusion

It is now the time to call for the expansion of a global Green Port Standards. The basic framework has been established by EcoPort PERS certification to develop a European generally accepted green port standard. Since 2011, the EcoPort standard has been able to address all the 10 major Europe environmental issues, but why limit to just Europe? It can always be extended throughout the world. Yes, there is an active action by a neutral and independent ECO Sustainability Logistics Supply Chain Foundation (ECPSLC) to promote EcoPort PERS methodology to ports and terminals around the world, but it is not enough.

Ports authorities has to step up the efforts to ensure that the world's environmental sustainability is upheld to the maximum order. EcoPorts has proven its overarching principle to raise the awareness on environmental protection. The method can only be achieved via cooperation and knowledge levelling between participating ports to improve the environmental management.

Today the EcoPorts PERS is recognized by the World Bank as a global standard for environmental risk prevention for port finance scheme (ESPO, 2012). The PERS too is now recognized by European Seaport Association, African Ports Association, Taiwan Ports International Corporation, United Nations Environmental Program (UNEP), Arab Seaports Federations and the American Association of Port Authorities (AAPA) as the only port focused environmental management system (Woolridge, 2017). **Appendix II** at the end of this paper is a summary of the ports that have received the PERS status, and the list is growing.

Let us all promote PERS as the global green port standard. Why do we need to reinvent the wheel? After all, we are all promoting a sustainable lifestyle, it is for us now and for our children for the years to come.

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**Appendix 1: Green Ports across Asia**

No	Port	Initiative	Year
1	Shanghai Yangshan Port's	New fully automated terminal is aiming for zero-emissions and an overall cut to energy consumption of 70%	2018
2	PSA Singapore	Installed an eco-friendly 4MW solar photovoltaic system which is a clean energy system	2018
3	Port of Tanjung Pelepas (PTP)	Installed new cable reel technology to provide electrical power for high-reach STS cranes. The system will boost green efficiency by optimising productivity and reducing the environmental impact of handling operations.	2018
4	Johor Port Authority (JPA)	Teamed up with Universiti Teknologi Malaysia to develop an online Ship Emission Management System which will help JPA to monitor, calculate and regulate emissions through web-based and mobile applications	2018
5	Johor Port Authority (JPA)	Developed The Green Port Policy	2015
6	Saigon Newport (SNP)	Continuously upgrading equipment using clean energy; training employees on environmental protection and its initiatives on reducing dust and noise.	2018
7	Johor Port Berhad (JPB)	Planting trees continuously at available areas neutralize carbon emission. JPB has won 2 state awards in landscape category	2014-2018
8	Colombo International Container Terminals (CICT)	Converted 40 of its diesel-operated rubber-tyred gantry (RTG) cranes to electric (E-RTGs) to achieve zero emissions operations, a 45% reduction in carbon dioxide emissions and a diesel consumption reduction of more than 95%.	2018
9	Port of Colombo	Invested USD\$10m project to convert cranes from diesel to electric-powered	2018
10	Maritime and Port Authority of Singapore (MPA),	Signed an MOU with Shell to advance clean fuel technologies, including greater automation to reduce emissions.	2017
11	The Ministry of Shipping, Government of India	Project Green Ports was initiated to reduce the carbon emissions in Indian ports factoring in the environmental perspective for sustained growth,	2017
12	All ports within the Pearl River Delta, the Yangtze River Delta and Bohai Bay	China's Marine Safety Administration (MSA) has extended the domestic Emissions Control Areas (ECA)	2017
13	Danish Maritime Authority , Norwegian Maritime Authority & Maritime and Port Authority of Singapore	Agreed to champion the use of e-certificates (e-certs) for the shipping community as part of a drive to digitalize the shipping industry, reduce administrative manpower and costs and become more efficient.	2017
14	New Priok Container Terminal One (NPCT1)	eRTG project started in 2015 and allows the container terminal to significantly reduce CO2 emissions, noise pollution and fuel costs, by up to 90%, helping it to meet emission requirements and goals of environmental care, as well as meeting pursuing its aim to become a green port.	2015-2016
15	Haldia Port Complex, part of Kolkata Port Trust	The Indian 'first' green port recognized after a bio-diesel dispensing unit will apparently use bio-diesel to run its railway engines, trucks and other vehicles.	2015
16	Taiwan International Port Corporation (TIPC)	Activated the "Greening the Ports action plan" which integrates environmental protection into its operating philosophy, with as goal to enhance the competitiveness and promote green port policies	2014
17	Busan Port Authority (BPA)	To develop up to 22 new berths to add a further 6.6m teu by 2020. The overall port expansion will include a number of eco-friendly innovations including the continued switch from diesel to electric equipment at the terminals and to install warehouse roofs with solar power.	2014

**Appendix II:** Ports with PERS Certification

No	Port	Country
1	Port De Commerce De Lorient	France
2	Tanger Med Port Authority	Morocco
3	Ports of Bremen/Bremerhaven	Germany
4	NV Port of Harlingen	Netherlands
5	Peterhead Port Authority	UK
6	Groningen Seaports	Netherlands
7	Dublin Port Company	Ireland
8	Piraeus Port Authority SA	Greece
9	Société d'Exploitation des Ports du Détroit - Port de Calais	France
10	Igoumenitsa Port Authority SA	Greece
11	Shannon Foynes Port Company	Ireland
12	Port of Moerdijk	Netherlands
13	JadeWeserPort Realisierungs GmbH & Co. KG	Germany
14	Autoridad Portuaria de Castellón	Spain
15	Nantes - Saint Nazaire Port Authority	France
16	Shoreham Port Authority	UK
17	Corfu Port Authority	Greece
18	Port of Le Havre Authority	France
19	Port of Barcelona Spain	Spain
20	Port of Vigo Spain	Spain
21	Port of Cartagena Spain PERS	Spain
22	Port of Den Helder Netherlands	Netherland
23	Exploitiemaatschappij Havencomplex Lauwersoog BV. (EHL)	Netherlands
24	Authority Port of Algeciras Bay	Spain
25	port of Den Oever-Hollands Kroon	Netherlands
26	Port Authority of Huelva	Spain
27	Niedersachsen Ports Wilhelmshaven	Germany
28	Autoridad Portuaria De Melilla	Spain
29	Grand Port Maritime de Dunkerque	France
30	Niedersachsen Ports Emden	Germany
31	Niedersachsen Ports GmbH & Co. KG	Germany
32	Niedersachsen Ports GmbH & Co. KG*	Germany

\* Renewal