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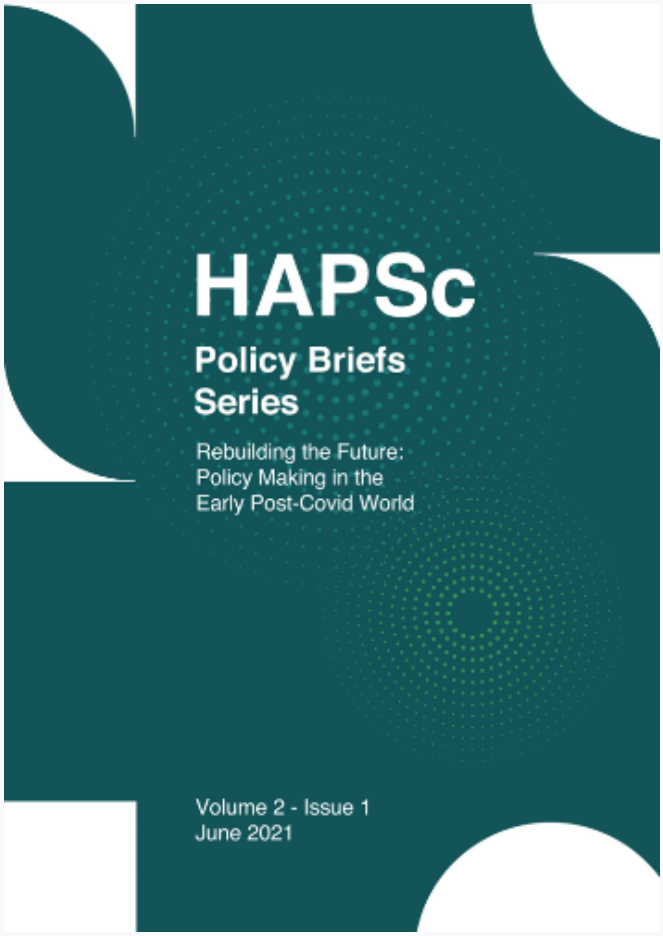

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Environmental Issues of European Cargo Ports[1]

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Abstract

Sea ports and the shipping industry are crucial elements of the international supply chain. Over the last years there has been a growing awareness on the environmental impact of port operations and development. The development of port industry can have a substantial environmental impact. Sustainability is expressed in economic, environmental, and social dimension. The major impacts are on air pollution and especially greenhouse gas emission, the water pollution and the health effects. International policy instruments and governments are crucial factors defining the actions of ports, which are expected to enhance environmental management and reduce the harm of shipping activities. This paper focuses on the environmental dimension and the attempts to reduce the GHG emissions in line with the Paris Agreement and the 2030 UN SDGs. The attention of European Union regulatory environmental framework is laid in the reduction in the sulphur content of certain liquid fuels, the framework for port reception facilities for the delivery of waste from ships, and the Alternative Fuels Infrastructure. The European Green Deal aims to a 90% reduction in the transport emissions by 2050.

Keywords: Ports; Sustainability; Environmental impact of port activity; Green Deal.

Introduction

Sea ports and shipping industry are crucial elements of the international supply chain, as maritime trade volumes reached a total of 11.08 billion tons in 2019 (UNCTAD, 2020). Nowadays there has been growing awareness on the environmental impact of port operations and development. Important environmental aspects of ports activities are those of vessel and cargo handling operations, industrial activities in ports, port planning and extension actions, and hinterland accessibility (Lam & Notteboom, 2014).

Sustainability is expressed in economic, environmental, and social dimension. According to Serrano et al. (2018) the concept of port sustainability comprises four dimensions; the economic, the social, the environmental (Sislian, et al., 2016) and the institutional dimension (Laxe et al., 2017).

The World Ports Sustainability Program (WPSP) was launched in 2018 to contribute to the sustainable development of world ports in line with United Nations Sustainability Agenda and its seventeen Sustainable Development Goals (SDGs) (Verhoeven, 2020). The Program is led by the International Association of Ports and Harbors (IAPH) with some of the world's major port industry-

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related organizations. The focus areas are the resilient infrastructure, climate and energy, community outreach and port city dialogue, safety and security, and governance and ethics.

The development of port industry can have substantial environmental impact. One of the major impacts is air pollution and especially greenhouse gas emission (Lashof & Ahuja, 1990). Ships that call at ports provoke significant air pollution. Land side activities and mainly cargo operations at terminals, are responsible for air quality deterioration. Emissions of dust from bulk cargo handling, electricity consumption, and gases from cargo handling equipment have a negative impact on the air quality (Villalba & Gemechu, 2011). Another major impact is water pollution deriving from ballast water and cargo residue. Furthermore, health effects such as asthma, have been noticed to the residents of the surrounding port area (Bailey & Solomon, 2004).

Environmental policy

Legislative initiatives are created to improve the quality of marine fuels. Ports comply with regulations, including environmental requirements and investment to avoid legal affairs. Another motive for ports undertaking environmental initiatives is responding to societal pressures. Environmentally friendly practices can influence positively the attraction of trading partners and potential investors (Lee & Lam, 2012). Other motivation for investing in environmental management is the improvement of operations related to operational costs as technology replacement in port industry is hindered due to the capital-intensive assets. The operational issues are determined by operational performance, cost's reduction and control, health and safety issues, labor relations, processes standardization, environmental problem-solving and remediation plan (Adams, et al., 2009). Overall, ports are required to comply with regulatory and societal requirements with respect to environmental protection.

The environmental policy can be categorized according to the type of enforcement mechanism to supporting investments, market access control, environmental standard regulation, pricing, and monitoring and measuring (Aregall et al., 2018). They refer to action for addressing vessel emissions such as cold ironing, use of Liquefied Natural Gas (LNG) and vessel speed reduction in the port.

EU Policy

The European Union regulatory environmental framework regarding the European ports' environmental policies includes the Natura 2000 ecological network including all Special Protection Areas, reduction in the sulphur content of certain liquid fuels, framework for port reception facilities for the delivery of waste from ships, the Alternative Fuels Infrastructure, regulation on shipments of

waste, and voluntary participation by organizations in a Community eco-management and audit scheme (EMAS) (Alexandropoulou et al., 2021). On December 2019, the European Green Deal, developed a strategy on implementing the United Nation's 2030 Agenda and the SDGs, by increasing the European Union's greenhouse gas emission reductions target for 2030 to at least 50% and towards 55% compared with 1990 levels. The Green Deal aims to 90% reduction in the transport emissions by 2050, boosting the supply of sustainable alternative transport fuels for aviation, shipping and road transport (Alexandropoulou et al., 2021). The greening of the shipping sector is priority for European ports. In 2020, the European Commission published the Sustainable Europe Investment Plan as the investment pillar of the European Green Deal and aims to exploit over €1 Trillion in the next decade to implement the objectives of the Green Deal (ESPO, 2019-2020).

Port management tools

Ports should consider transnational communication and policy learning in developing their green port management tools. Firstly, pricing strategies can improve port's competitive position for instance by lowering charges (Yap, Lam & Cullinane, 2011). It is common in European ports to exert the environmental governance through the mechanism of terminal concession agreements, which often take the form of performance-based agreements to create incentives for terminal operator to meet the objectives of the port authority (Notteboom et al., 2012).

From the regulators point of view, International Maritime Organization (IMO) and Marine Environment Protection Committee have provided treaties, regulations and guidelines concerning the green impact of the port and shipping sector. The major convention of relevance here is the International Convention for the Prevention of Pollution from Ships (MARPOL), which adopted in 1973 and entered into force in 1983. MARPOL established a global standard to prevent pollution of the marine environment by ships from operational or accidental causes. The original annexes focused only on preventing pollution to the marine environment, but it has been updated at various times and in 2005 MARPOL Annex VI came into force with the aim of preventing air pollution from ships (Bergqvist & Monios, 2019). In 2010 imposed more stringent limits and introduce emission control areas (ECAs). ECAs are often referred to as SECAs because of their prominent sulphur limit of 0.1% as of 2015. The amendment set a reduced global cap of sulphur levels from 3.5% to 0.5% by 2020.

In 2008, IAPH requested its Port Environment Committee, in collaboration with regional port organizations, to provide a mechanism for assisting ports to combat climate change. As a result, in 2008 the C40 World Ports Climate Declaration was adopted, leading to the World Port Climate Initiative (WPCI), numbering 55 ports worldwide that pursue various green measures like discounts

to vessels scoring above a certain threshold on the Environmental Ship Index (ESI). This led, in 2018, to WPSP which developed the ESI to enable better emission visibility. About 5500 vessels of the world fleet of 50,000 vessels are registered so far (WPCI, 2017).

The European Union has pioneered in creating sustainable ports by implementing policies like energy efficiency and reduction of greenhouse gas emissions (Di Vaio & Varriale, 2018). EU Regulation No.2015/575 focused on monitoring and reporting carbon dioxide emissions from maritime transport (Sharma & Das, 2020). In 2018, EU implemented a Monitoring, Reporting and Verification scheme for voyages, to and from European ports, according to which shipping companies shall report on GHG.

ESPO introduced the environmental indicators which provide information about the management efforts that influence the environmental performance of the ports. The Port Authority defines its intentions and principles concerning the environmental performance which provides a framework for action and assists ports in developing environmental targets (ESPO, 2020).

The Top 10 environmental priorities reflect the environmental issues that are prioritized by the port managing bodies over time and should be considered when developing port regulations in Europe. The relative positions of the priorities have changed over the years. The first priority for ports since 2013 had been the air quality which can be explained by the continuous establishment of new legislation. Climate change raised in priority ranking for ports during recent years as a result of the ongoing EU and national policy discussions for the issue of climate change. Noise and relationship with the local community are both important issues, especially for urban ports. The relationship with the local community is crucial to a port's license to operate. The management of ship waste remains a priority issue and reflects the economic costs and the environmental impacts of waste handling. It is an important component of programs to assist 'green shipping' and can also be a criterion for the application of differentiated fees. Water quality increase in the top 10 port priorities as well as the garbage/port waste reflecting ports readiness to reduce marine litter (ESPO, 2020).

Green services to shipping

Green services are of increasing importance and refer to the efforts by the port managing bodies in order to contribute to energy transition and greener shipping. These services are the provision of OPS, LNG bunkering facilities and environmentally differentiated port fees (ESPO, 2020). As fossil fuels are slowly being replaced by renewable energy sources, many port authorities are supporting energy transition by facilitating renewable energy production (ESPO, 2016).

Shore side policy refers to cold ironing or onshore power supply (OPS) or shore-side electricity (SSE) is the process whereby ships at berth connect to shore side electricity rather than running their auxiliary generators in order to provide power for hoteling (Bergqvist & Monios, 2019). The use of SSE instead of auxiliary engines reduces the consumption of marine fuel, exhaust emissions, noises, and vibrations from ships. Emission reduction depends on the proportion of renewable energy generation (Bergqvist & Monios, 2019). Low voltage OPS mainly relates to inland and domestic vessels, and auxiliary vessels. The high voltage OPS figure refers to commercial seagoing vessels, where around half of the ports offer high voltage OPS. Trends are steady due to the higher costs of using electricity compared to tax-exempt fossil marine fuels. When ships connect with the shore-side electricity system, they are requested to pay energy tax. Only a limited number of EU Members have obtained, after a long administrative process, a temporary permit by the EU, to apply a reduced rate of taxation to shore-side electricity for ships (ESPO, 2020).

LNG only partially reduces GHG emissions compared to cold ironing, its performance with local air emissions is almost equal and it does not require the same infrastructure investments as cold ironing. On the other hand, it will not reduce engine noise as cold ironing does, and remains an expense for vessels to be able to adapt their engines (Winnes et al., 2015). An increase of 11% has been noted since 2016 and currently, one third of the ports offer this service to ships (ESPO, 2020).

Legislative initiatives and environmentally differentiated port dues have been undertaken in the attempt to enhance the quality of marine fuels that ships use (Adams et al., 2009). These ports aim to encourage the reduction of air emissions and to enhance waste management. In the next two years, around one third of ports plan to introduce environmentally differentiated port fees (ESPO, 2020).

Conclusions

According to literature review, as port operations impact the environment in terms of water and air quality, the attempts focus to reduce the GHG emissions and the marine pollution from ports in line with the Paris Agreement and the 2030 UN SDGs. The legislative initiatives focus on the improvement of marine fuels' quality. Ports are motivated to comply with environmental regulations in order to avoid legal affairs, to respond to societal pressures, and improve operational performance. These initiatives might result in higher costs in the short term but increase the competitiveness of the port in the medium to long term. Environmental policy includes the cold ironing, the use of LNG and the reduction of vessels' speed.

The attention of European Union regulatory environmental framework is laid in the reduction in the sulphur content of certain liquid fuels, the framework for port reception facilities for the delivery of

waste from ships, and the Alternative Fuels Infrastructure. The European Green Deal aims to a 90% reduction in the transport emissions by 2050. The port management tools include pricing strategies and concession agreements. IAPH through WPCI pursued green measures like discounts to vessels according to their ESI's score. Climate change raised in priority ranking for ports during recent years. The management of ship waste remains a priority issue and reflects the economic costs and the environmental impacts.

Lastly, six common green port performance indicators are the speed reduction after landfall, cold ironing, using electrically powered equipment, encouraging the use of low-Sulphur fuel, use of recyclable resources, and encouraging public transport mode development.

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