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A global review of the hinterland dimension of green port strategies

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ABSTRACT

Despite a growing literature on strategies to reduce emissions and other externalities in shipping and ports, very little attention has been given to the port's role in reducing negative externalities in its hinterland. This paper addresses this gap by reviewing ports across the globe to identify which ports have implemented measures to improve the environmental performance of hinterland transport. Results show that only 76 out of 365 ports examined are doing so. The measures applied are identified, related to different goals and their challenges discussed. The most common measures are found to be technology improvements, infrastructure development and monitoring programmes, and the most advanced ports in green hinterland strategies are Rotterdam, Los Angeles/Long Beach and Hamburg, although many ports that are world leaders in green port strategies have not implemented measures in the hinterland dimension. Different port groups are segmented according to their mix of goals and measures as a foundation for future research.

1. Introduction

It is well accepted that ports today play a greater role than simply handling cargo on the quayside. Both the sources of their competition and the extent of their influence stretch across the sea and also deep into the hinterland (Bergqvist, 2015). Their management and operational strategies are entwined with stakeholders on several scales, from local to global and from business to government. In the last decade the port hinterland has attracted increasing attention, as the port's role in coordinating hinterland logistics activities has become not only a necessary aspect of maintaining competitiveness but also a tool of competition (Notteboom and Rodrigue, 2005; Bergqvist and Woxenius, 2011; Kramberger et al., 2018). Ports are a potential focal point for coordinating these strategies (de Langen, 2008; Ng and Liu, 2014) since their activities directly and indirectly affect local and regional traffic systems. Furthermore, the port's role in the transport chain has the potential to shape the social and environmental performance of transportation systems (OECD, 2011). While many ports choose not to act beyond complying with existing environmental regulations in their city, region or country, in some cases they have exercised their potential for addressing both social and environmental externalities.

Academic literature over the last decade has increasingly focused on the challenge of reducing emissions from shipping and ports. The main issues relate to reducing emissions of vessels while at sea (in 2007–2012 accounting for 2.8% of global GHG emissions or double the level produced by air travel – Smith et al., 2014), mostly from IMO regulations on cleaner fuel (Cullinane and Bergqvist, 2014; Lister et al., 2015). These have focused on SOx and more recently on NOx rather than CO_2 despite the large contribution to global GHG emissions from shipping. Other strategies include vessel design improvements (Lindstad et al., 2012; Lindstad and Eskeland, 2015) and fuel usage reduction through slow steaming (Cariou, 2011; Zis et al., 2015).

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Vessel emissions in ports are increasingly of concern, especially for SOx, NOx and PM which affect the health of local populations. Vessel emissions in ports are mainly addressed by methods such as cold ironing, use of LNG and vessel speed reduction in the port (Winkel et al., 2016; Sciberras et al., 2015; Styhre et al., 2017; Winnes et al., 2015). Emissions actually produced by port activities contribute less of the total emissions but are increasingly addressed through methods such as increasing operational efficiency (Wilmsmeier and Spengler, 2016) and generating their own green energy onsite (e.g. wind turbines) (Acciaro et al., 2014a). As well as modelling emissions reductions through various strategies (e.g. Yang et al., 2012; Gibbs et al., 2014), some authors have taken a management perspective on the kind of measures available for port managers and the challenges associated with each one (e.g. Lam and Notteboom, 2014; Acciaro et al., 2014b).

However, very few of these papers have addressed the environmental performance of the landside, even though this aspect of the port's activities contribute to a range of externalities, especially emissions (both local and GHG) and congestion (Bergqvist and Egels-Zandén, 2012; Bergqvist et al., 2015). These externalities are normally calculated and accounted for within land transport figures; for example, the transport sector is responsible for about a quarter of GHG emissions in Europe, as well as the main source of local air pollution (European Commission, 2017). Yet, emissions from port hinterland transport only occur because of the port activity and indeed if they are to be improved then interaction between the port and inland actors will be required. Thus, while it may not be entirely correct to suggest that it is the port's responsibility in the same way as emissions within the port area, we argue nonetheless that the greening of hinterland transport is at least partly the port's responsibility. Gibbs et al. (2014) show that in an analysis of the UK's busiest container port Felixstowe, hinterland transport emissions (138 kT CO_2) are about double the emissions produced by port activities (71.5 kT CO_2) and they also argue that they should be considered by ports as within the scope of their carbon reduction activities.

As the interchange point linking land and sea, there are three types of emissions over which ports have some influence, according to the WPCI: emissions from port activities (handling, etc.), indirect emissions from generation of electricity used in port activities, and emissions from transport to/from the port (including vessels and hinterland transport). With regard to the third set, there has been significant work on vessels but not on inland transport, suggesting that, despite the common view that ports are integrated in their hinterlands, there remains a disjunct between shipping and inland transport when it comes to academic studies, with only few environmental studies incorporating the entire end-to-end chain (Gibbs et al., 2014).

This exploratory review will add to the literature by focusing on green port strategies in the hinterland. The paper aims to address the lack of studies on port hinterland sustainability by identifying the current issues recognised by ports and classifying their main goals, before identifying the potential measures available and then analysing ports across the globe to determine the current application of these measures. Finally, the segmentation of port groups will lead to a benchmarking of key issues associated with the greening or hinterland transport as a spur to further research on this topic. Such measures have not yet been identified in previous research, therefore this research may contribute towards helping ports to improve the environmental performance of their connecting transport network, thus adding the missing hinterland dimension to the existing studies on the sea leg and the port area.

2. Green port regulation

The International Maritime Organisation (IMO) has slowly introduced various regulations to reduce emissions in sea transport, through various annexes to the MARPOL convention originally introduced in 1973 (Lister et al., 2015). These cover various maritime pollution issues such as ballast water, oil spills, emissions and invasive species. Focusing on emissions reduction, there are SECA areas already in place with a cap of 0.1% sulphur and a global sulphur limit of 0.5% from 2020, some NOx limits on new vessels, the Energy Efficiency Design Index (EEDI) and the Ship Energy Efficiency Management Plan (SEEMP). But there remains no global CO_2 limit. However, the IMO is not the only actor in shipping regulation. The EU has brought in a regulation that all vessels calling at EU ports for longer than two hours must use fuel with a sulphur content below 0.1%. Additionally, they will apply a new MRV (monitoring, reporting and verification) regulation as of January 2018, requiring compulsory monitoring of CO_2 emitted by vessels larger than 5000 gross tonnage calling at EU ports as the first step towards supposedly setting targets, but there are no limits or actions as yet. However, these all apply to ships and ship operators and not to the ports.

Various governments and international bodies such as the EU also encourage various actions in ports. The EU white paper on transport (European Commission, 2011: 9) aimed to cut carbon emissions from transport by 60% by 2050, based on strategies such as reducing "CO_2 emissions from maritime bunker fuels by 40%" and an intermodal target of "30% of road freight over 300 km should shift to other modes such as rail or waterborne transport by 2030, and more than 50% by 2050, facilitated by efficient and green freight corridors." More recently, EU directive 2014/94 requires all EU ports to prioritise cold ironing and LNG bunkering availability (European Commission, 2014).

In addition to directives from the European Commission, the European Sea Ports Organisation (ESPO) promotes environmental management, policies and plans in European ports. In order to promote the ESPO Green Guide, in 1999 this institution established the EcoPorts Foundation, a network of European ports to identify the significant environmental aspects of port activities, products and services. Similarly, in the Americas, the American Association of Port Authorities (AAPA), with 150 members in North, Central and South America, has developed a guide for environmental management, the Environmental Management Handbook (EMH).

Various international initiatives provide new steps towards becoming greener. In 2008 the International Association of Ports and Harbors (IAPH) requested its Port Environment Committee, in collaboration with the regional port organizations, to provide a mechanism for assisting the ports to combat climate change. As a result, in 2008 the C40 World Ports Climate Declaration was adopted, which elaborates initiatives to reduce CO_2 emissions of hinterland transport. This led to what is now the World Port Climate Initiative (WPCI), numbering 55 ports worldwide that pursue various green measures such as giving discounts to vessels scoring