

**Environmental performance as a port selection criterion**

By

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## Signature page

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## **Abstract**

Maritime transport is the largest mode of transport and the container segment in particular has grown strongly in the last two decades. Many ports compete against each other to attract containers and this study analyzes whether ports use environmental performance as a competitive differentiator. The key players who decide to which ports containers are shipped openly advocate their efforts to reduce environmental impacts. With regard to freight transport, their focus on reducing environmental impacts is on Green House Gas (GHG) emissions, and this could imply that ports with relatively low GHG emissions will become preferred ports for these key players. However, these key players who select the port of choice, especially the large retailers and 3PLs, take the whole supply chain into account when addressing environmental impacts. The impacts of handling containers within ports are relatively small compared to the overall supply chain impacts and the environmental performance of the ports is consequently not expected to become a decisive port selection criterion. The key players that make the port selection decision are increasingly including environmental issues when selecting carriers for their transport needs. From a commercial perspective, ports are therefore recommended to ensure that there are adequate 'green' transport options between the port and its hinterland.

*Keywords:* port selection, North America, retail, container transport, environmental performance, green supply chains, shipping.

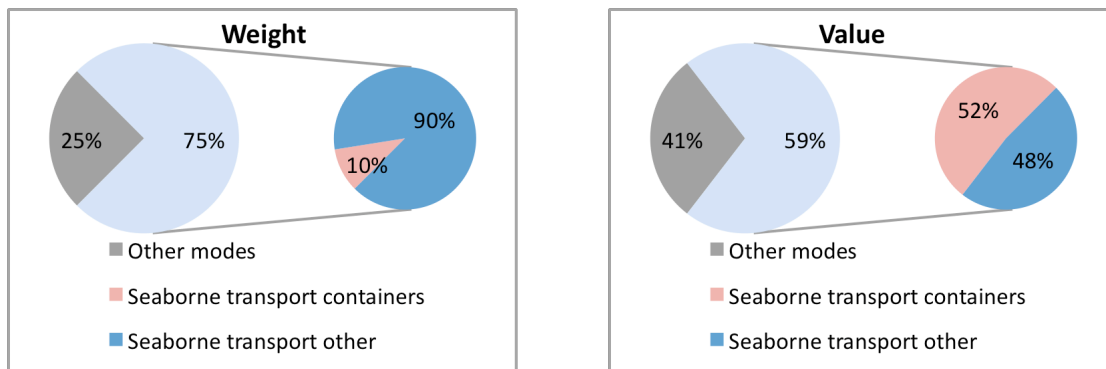
## 1 Introduction

### 1.1 General background environmental issues in ports

Maritime transport is the most important transport mode in terms of total cargo weight and value transported. In 2006, this transport mode accounted for 75% of the total world trade measured in tonnes and 59% in terms of value (Mandryk, 2009).

In the last two decades, containerized seaborne trade was the fastest growing segment. Until 2009, this segment grew at an average annual rate of approximately 10%, reaching 137 million TEU<sup>1</sup> in 2008 (UNCTAD, 2009). In terms of weight transported, the container segment only accounted for 10% of the total seaborne trade, but it represented 52% of the total value of the seaborne trade in 2006 (Mandryk, 2009).

Figure 1: Share of seaborne transport in total transport in weight and value of cargo



Source: Created from data supplied by Mandryk, 2009.

At the request of the World Shipping Council<sup>2</sup>, IHS Global Insight (2009) determined the economic contribution of the shipping line industry and estimated that the shipping line industry accounted for more than 4 million direct jobs worldwide<sup>3</sup>. The direct output was

<sup>1</sup> The twenty-foot equivalent unit (TEU) is a type of container often used as a unit of cargo capacity to describe the capacity of container ships and container terminals. A TEU container is 20 feet long, 8 feet wide and 8 feet and 6 inches high (Maersk, n.d.)

<sup>2</sup> A Non Governmental Organization (NGO) representing the liner shipping industry.

<sup>3</sup> This excludes port related employment, but does include jobs created by the deployment of ro-ro ships and car carriers. In 2009 ro-ro represented 24% of the number of ships deployed by shipping lines and 4% of the total dwt. Car carriers represented 11% of the number of ships deployed by shipping lines and 1% of



valued at US\$183 billion in 2007 from both operations and the construction of ships (IHS Global Insight, 2009).

The economic importance and strong growth of container transport has sparked port competition. The introduction of the container meant that an important and growing part of the seaborne trade was standardized. Standardization enabled radical efficiency increases in inland transport and consequently ports could serve a larger region. This resulted in a shift from ports being monopolistic in nature to now having to compete with other ports that could serve the same region efficiently (Cullinane & Song, 2006). As a result container shipping lines and cargo owners can often switch relatively easy from one port to another and container transport can therefore be described as one of the “least captive cargo types” (Zondag et al., 2010, p.179). If ports do not pay close attention to developments in the container transport market, they could lose cargo to more assertive ports.

One development that is currently taking place in the transport market is an increase in the number of initiatives to reduce environmental impacts of supply chains. Large shipping lines and cargo owners, such as Maersk (2010) and Wal-Mart (2010) have publicly committed to strongly reducing their Green House Gas (GHG)<sup>4</sup> emissions.

This increased awareness for the environmental impacts of transport is not limited to a few major companies. A recent North American survey amongst 600 supply chain professionals showed that 75% of the respondents are of the opinion that environmental issues are an important factor in their supply chain strategy (Muir, 2010). Another recent North American survey of 180 North American supply chain professionals showed that 38% of the responding cargo owners already ask logistics service providers for a sustainability plan before they engage in business agreements with these service providers (Blaeser, 2011).

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total dwt. Container ships represented 65% of the number of ships and 95% of the total dwt of ships deployed by shipping lines

<sup>4</sup> GHG include gasses such as carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbon (HFC), perfluorocarbon (PFC) and silicon tetrafluoride (SF<sub>6</sub>). These gasses prevent wavelengths of electromagnetic radiation from leaving the Earth's surface and consequently contribute to global warming (Comtois & Slack, 2007).

This increased awareness for the environmental impacts in supply chains could mean that the environmental issues in ports will play a role in the selection of ports by cargo owners and shipping lines. Examples of environmental issues in ports are:

- Water quality can be impacted, e.g. through:
  - Ballast water, required to control a ship's stability and draught, from one region may contain invasive aquatic species that, when discharged in another region, may disrupt the local marine ecosystem;
  - Waste water from ships, such as from galleys, showers, kitchen, etc. and bilge waters from machinery and auxiliary systems. Waste water that is biologically or chemically active can damage marine life when discharged;
  - Stormwater runoff from terminals, docks, buildings, etc., occurs after precipitation and can contain contaminated dust, cargo residues and spills;
  - Anti-fouling paint, which is applied as coating to ships to prevent the growth of organisms on the ship's hull. This paint can contain organotin tributyltin, which leaches into the sea and damages the marine ecosystem.
- Air quality can be impacted, for example through:
  - Ships in the port that burn fuel oil emit sulphur oxide (SO<sub>x</sub>), nitrogen oxides (NO<sub>x</sub>), chlorofluorocarbons (CFCs);
  - Industry complexes located in the port often release polluting emissions, for example sulphur dioxide (SO<sub>2</sub>);
  - Land transportation and terminals in the port often use combustion engines that generate air pollution.
- Waste management is necessary to deal with the waste generated by the operations onboard a ship. This waste may contain high levels of bacteria that are harmful to marine ecosystems when discharged into sea and floating plastic can cause injury to marine life when mistaken for a food source;
- Energy consumption of ports may be intensive when considering cargo handling, lighting and the ships in the ports and can generate substantial amounts of GHG;
- Dust emissions generated by activities in the port can release harmful unhealthy substances that may affect the health of port employees and local communities.

- Noise created by ships, trucks, trains, cargo handling equipment, and construction and maintenance activities can affect both humans and animals, by hampering communication, creating fear and causing physical pain;
- Dredging has a direct impact on the marine environment as it can modify the hydrology, create turbidity and lead to direct mortality of marine organisms. The water and marine sediments dredged can also be contaminated and dredging can spread these contaminants;
- Resource conservation requires attention because ship movements, maintenance activities and the construction of new infrastructures have an impact on terrestrial and marine ecosystems (Comtois & Slack, 2007).

Many national and international guidelines and regulations have been implemented to address these environmental issues. Ports have also taken voluntary measures that go beyond the legal requirements, for example the implementation of an Environmental Management System (EMS) by the Halifax Port Authority, which is ISO 14001<sup>5</sup> certified (Halifax Port Authority, n.d.).

According to Adams et al. (2009) investments in such environmental performance improvement measures may benefit the competitive position of ports. However, it remains unclear if, and to what extent environmental performance initiatives have an impact on port selection and what specific initiatives could have an impact on the competitive position of a port (Adams et al., 2009).

## 1.2 Research Question and Scope

This paper will answer the following research question:

*Can environmental initiatives improve the competitive position of a port?*

The answer to this question could differ per region, cargo type and type of company that controls the supply chain. This paper is focused on the North-American retail market and the import container transport it generates. The paper pays special attention to the ports

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<sup>5</sup> An EMS that meets the requirements of the International Organization for Standardization (ISO) 14001 is a management tool enables the company or organization to identify and control the environmental impact of its activities, products or services, and to improve its environmental performance. The company has to implement a systematic approach to setting environmental objectives and targets, to achieving these and to demonstrating that they have been achieved (ISO, 2011).

competing for transport flows to the Midwest in the United States of America (U.S.). This region is chosen based on the number of ports that receive containers intended for the U.S. Midwest and the competition between these ports to attract containers. This competition could mean that these ports are looking for innovative ways to differentiate themselves and improving the implementation of environmental initiatives could be one of the methods used.

This document describes active measures and not regulations by government that could influence port competition. For example the effects on the competitive position of ports as a result of Emission Control Areas are not included in this paper<sup>6</sup>.

The first step to determine if environmental initiatives could influence the competitive position of a port is to analyze who are the key players in relation to port selection and what criteria they apply to select a port. This analysis is presented in the second chapter and is based on an academic literature review.

The third, fourth and fifth chapters provide an overview of the relevance of environmental issues for the different key players regarding port selection. These chapters include examples of the environmental initiatives implemented by the largest companies that are decisive in port selection decisions. This information is gathered from industry reports and company communication materials.

Based on publicly available information, chapter 6 explores what environmental initiatives the main ports competing for the U.S. Midwest are implementing. Special attention is paid to determine whether these initiatives were developed to influence port selection decisions by the key players.

Chapter 7 presents an overview of a selection of partnerships and initiatives that could influence the competitive position of ports in North America. It is discussed how ports could use these partnerships and initiatives to positively influence port selection decisions of the key players.

The conclusion and recommendations with regard to how ports can best proceed based on the findings of this report are presented in chapter 8.

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<sup>6</sup> Under the International Maritime Organization's (IMO) regulations for the Prevention of Air Pollution from Ships, certain Emission Control Areas with more stringent controls on SO<sub>x</sub> and NO<sub>x</sub> emissions have been designated (IMO, n.d.).

## **2 Port selection**

This chapter presents the results of an analysis of academic literature on port selection. It describes the key players involved in the port selection decision and the criteria on which this decision is based.

### **2.1 Key players in port selection decisions**

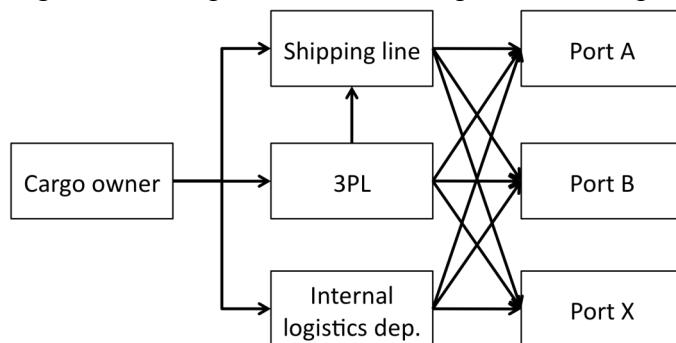
A first important notion expressed in many articles is that ports are part of the supply chains of cargo owners and, in order to be competitive, port services need to fit into door-to-door supply chains (Bichou & Gray, 2004; De Langen, 2007; Tongzon, 2009). This means that ports not only compete on the basis of their own performance, but also on the basis of how well they are or can be integrated in the supply chains (Notteboom, 2007; Magala & Sammons, 2008). This makes the performance of the ports dependent on the performance of the supply chains that make use of the port. Improvements made by one of the service providers in the supply chain, for example a rail operator, could consequently lead to a competitive advantage for the port (Talley, 2009). On the other hand, ports risk losing cargo flows not only as a result of deficiencies in port infrastructure, terminal operations and inland connections, but also from supply chain reorganization (Carbone & De Martino, 2003).

Given this dependence on the performance of the supply chains as a whole, it is essential for ports to have a good understanding of the supply chains in which they are located. Especially important for ports is to know which parties have the decision-making power to determine the configuration of supply chains and the selection of ports included in those chains. A study by Bichou and Gray (2004) showed that many ports have difficulty in understanding the complex and changing supply chains because it has become more difficult to identify the party with power in the supply chain, and who, as a result, most likely makes the port selection decision. In some cases, this party is situated at the end of the chain (for example supermarket chains) and, in other cases, commodity traders have a major impact on the supply chain configuration and port selection decision (Notteboom, 2007). The complexity of many, especially intermodal, supply chains is

another factor that makes it hard to distinguish the party with the supply chain power (Taylor & Jackson, 2000). Notteboom (2007) argues that the question of who really decides which port to choose depends on the type of cargo involved, the cargo generating power of the cargo owner, the characteristics of the specific trade routes and the terms of trade. Therefore it may be impossible to provide a simple, universally applicable description of the port selection process. Still, a general overview will be provided of the main parties that could have the power to make the port selection decision.

A first basic starting point for port selection is the cargo owner (identified in the contract of sale for the goods) that wants to have its cargo transported; this may be either the buyer (consignee) or seller (shipper) of the goods. Tongzon (2009) groups these parties responsible for transport arrangements into three main types: those who have long-term contracts with shipping lines, those who are using third party logistics providers<sup>7</sup> (3PLs) and those that are independent cargo owners (that is, they manage the transport arrangements in-house and without long-term contracts with lines). The first category is committed to a particular carrier for a specific time period and is therefore dependent on the shipping lines' chosen port of call. Those that make use of a 3PL delegate the responsibility for the selection of a shipping line and/or port to the 3PLs. The third group, the independents, decide themselves, through their internal logistics department, with which shipping line and to which port their cargo is shipped (Tongzon, 2009). This is shown in figure 2.

Figure 2: Main parties involved in port selection process



<sup>7</sup> The term 3PL is used, because the large global freight forwarders also provide supply chain management services for their clients. They no longer only play an intermediary role between the shipper/consignee and carrier, but decide on the whole supply chain of their client, the shipper or the consignee (Magala & Sammons, 2008; Tongzon, 2009).

Slack (1985) and Hesse and Rodrigue (2004) also identify these three key players in their articles. They argue that supply chain power is particularly in the hands of firms such as large retail chains who are buying transport services, large shipping lines and large 3PLs who are trading and brokering orders.

Based on this description there are three key players that could have the power to make the port selection decision:

- The cargo owner: shipper or consignee;
- The third party logistics provider (3PL);
- The shipping line;

Bichou and Gray (2004) confirm that ports themselves acknowledge the fact that there are several players that could be decisive in port selection processes. The ports that participated in their study rank shipping lines as most important customer in relation to port selection power, closely followed by 3PLs and cargo owners. Though shipping lines can be decisive in the port selection process, this is not necessarily always the case. Ports risk not paying sufficient attention to the requirements of the other key players and thereby risk missing critical market developments.

It is clear that supply chain power is complex and can differ in specific supply chains. Therefore the relevant question becomes how cargo owners, shipping lines and 3PLs choose a port as part of the overall supply chain selection process.

## **2.2 Port selection criteria used by the key players**

The previous section showed that the cargo owner, shipping line and 3PL are the key players in the port selection process. Various studies and articles have elaborated on the criteria that these players apply to select a port. These criteria are discussed below.

### **2.2.1 The cargo owner**

When designing their supply chain, cargo owners<sup>8</sup> select the configuration that provides the greatest competitive advantage (Talley, 2009). Quality and reliability of the entire

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<sup>8</sup> The cargo owner can be either the shipper or the consignee. The consignee issues the purchase order and makes payment for the goods and therefore usually has ultimate control over how goods are transported (Tongzon, 2009). Therefore the cargo owner in this report refers to the consignee in the remainder of this report.

supply chain are important elements for the cargo owner to differentiate itself from other similar companies (Magala & Sammons, 2008).

Magala and Sammons (2008) mention a number of criteria, which they suggest to be used for modeling port selection decisions by cargo owners. These include accessibility to markets, connectivity, overall port efficiency, efficiency of supply chain interfaces and links, supply chain total cost, level of supply chain coordination and the carbon footprint of the supply chain. Tongzon (2009) also mentions a number of (subjective) qualitative port selection criteria for cargo owners, such as flexibility and ease of use, the port's marketing efforts, tradition, personal contacts and the level of cooperation that may be developed between the cargo owner and the port.

De Langen (2007) shows in his article on port selection by Austrian cargo owners that they are less willing than 3PLs to accept lower service levels and less eager to change ports for price reasons. This strengthens the notion that cargo owners focus more on quality of their supply chain than on costs, but De Langen (2007) does mention that this is dependent on the value of the cargo. This relatively low price sensitivity can be explained by the fact that transport costs are only a fraction of overall costs of the cargo owner. De Langen (2007) shows that, based on 15 questionnaires from Austrian cargo owners, these cargo owners indicate port selection choices are based on clear criteria, rather than on tradition or relations. This contrasts to what Tongzon (2009) suggests regarding cargo owners' port selection criteria<sup>9</sup>. The main selection criteria that the Austrian cargo owners identified are the quality of shipping services and the quality of the terminal operating companies. However, De Langen also demonstrates that it may take considerable time before a cargo owner chooses to make use of another port because of switching costs. These costs could arise from changing storage locations and changing the overall configuration of the supply chain, including supply chain partners. Reducing delays and increased efficiency of port services are identified by Austrian cargo owners as important reasons for selecting a more expensive port (De Langen, 2007).

Nir, Ling and Liang (2003) show, based on 309 questionnaires from Taiwanese cargo owners, that these cargo owners prefer the port closest to the origin or destination of the

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<sup>9</sup> This indicates that cultural differences between (potential) customers are also important elements to consider in a port's business development efforts.



cargo. They state that these cargo owners primarily consider the travel time and cost factors. They also show that if a cargo owner has chosen a port, it is likely that it will choose the same port again.

Brooks (2007) notes that mitigation of route risk may also play a role; for example, cargo owners may favour dividing their cargo over several routes so as to avoid the risk of port disruptions. In case of a disruption of services in one port, their entire supply chain is not at risk. It also facilitates adjusting their supply chains to avoid the disrupted port, since all the arrangements and contact to ship via other ports are already in place.

As stated previously, some cargo owners have contracts with 3PLs or shipping lines and do not make port selection choices themselves. For that reason the selection criteria of these parties are discussed below.

### **2.2.2 Shipping lines**

The selection criteria that shipping lines use when selecting ports to be included in their networks has received strong attention by academics. For example Aronietis et al. (2010) interviewed representatives of 11 shipping lines that serve the port of Antwerp. Chang, Lee and Tongzon (2008) sent questionnaires to shipping lines involved in the intra-Asia trade and trade routes between Asia and Europe in order to gain insights into the port selection criteria used by shipping lines. Based on the interviews by Aronietis et al. (2010) and the 28 questionnaires received by Chang, Lee and Tongzon (2008) it is clear that the availability of cargo is the main port selection criterion. This means that shipping lines choose ports where sufficient cargo is available to provide a profitable service. The study of Aronietis et al. (2010) shows that other critical port selection criteria that shipping lines mention are costs, hinterland connections, terminal capacity, reliability and the geographical location of the port.

In the case of transshipment ports, Lirn, Thanopoulou, Beynon and Beresford, (2004) show that, based on 16 responses of global shipping lines, the handling costs of containers, proximity to main navigation routes, proximity to import/export areas, basic infrastructure condition (water access and depth of the port) and existing feeder network are the five port selection criteria with the highest importance.

Based on returned questionnaires from 19 global shipping lines, Ng (2006) finds that shipping lines indicate that a cheap port does not necessarily guarantee business, while a more expensive port can still become an attractive option to port users if it can provide decent service quality. So, monetary cost is not the only component in explaining port attractiveness. Other factors, notably, time efficiency, geographical location and service quality, should also be taken into consideration.

According to Malchow and Kanafani (2004) the variables furthest from the control of port authorities, the oceanic and inland distances, have the greatest impact on shipping line's port selection. They also state that choice behaviour varies significantly across carriers as well as commodities. Evidence supports this notion that choice behaviour varies and different criteria can become more important in different circumstances. For example in 1996 Maersk requested deeper facilities on the east coast of the U.S., leading the Port of New York to deepen its facilities. Another example is that of the Dubai Ports Authority, which was the only port in the Gulf allowed to handle containers directly bound for the U.S., providing them with a competitive advantage (Jacobs & Hall, 2007).

Many port operators have designed their strategies based on the 'stated preference' of the shipping lines. However, Tongzon and Sawant (2007) claim that shipping lines often overstate their requirements for services in the port. Therefore, it is difficult to establish what is the minimum level of service and efficiency on which the shipping lines will not compromise. Once this minimum threshold is met, value added services and costs become more important in order to gain a competitive advantage for the ports.

### **2.2.3 3PLs**

From a theoretical perspective, 3PLs, when providing freight forwarding services, change the relatively price in-elastic demand of cargo owners to a price-elastic demand (De Langen, 2007). This is because an important source of a 3PL's income is the price difference between the rate the forwarder is paid by the cargo owner and the lower rate it has to pay to the carrier for the consolidated shipments of several cargo owners. As a result, it would be expected that 3PLs place a higher priority on price as a selection criterion. However, based on the study by Murphy, Daley and Dalenberg (1991) of 104 3PLs in the U.S., the most important criteria appear to be equipment availability (in order

to enable low inventory levels and just-in-time deliveries), shipment information, and loss or damage performance. In the study of De Langen (2007), the participating Austrian 3PLs indicated that the frequency and quality of shipping services, the hinterland connections and the location of the port were important port selection criteria.

Similar port selection criteria, as identified in the articles of Murphy, Daley and Dalenberg (1991) and De Langen (2007), were mentioned by the 48 Thai and Malaysian 3PLs that participated in the study by Tongzon (2009). These 3PLs indicated that the frequency of ship visits, operational efficiency, adequacy of port infrastructure, location, competitive port charges, quick response to port users' needs and port's reputation for cargo damage were important port selection criteria. The responses strongly favoured the quality of service over price, although there is a maximum price that they are willing to pay. All of these 3PLs are of the opinion that the most important elements in port selection are the reputation of their company and the goodwill of clients. Almost 70% of the participating 3PLs expressed that they have relied on personal contacts and experience when selecting a port, contrasting with the findings of De Langen (2007) who showed that Austrian 3PLs base their port decisions on clear criteria rather than on tradition or relations.

Interestingly, Tongzon (2009) shows that in the sequencing of choices almost 75% of participating 3PLs choose the shipping line first and then choose the port from those served by the shipping line. This would mean that, at least in Thailand and Malaysia, the shipping lines are a more important party when it comes to port selection.

### **2.3 Conclusion port selection**

The academic literature shows that the main parties involved in port selection decisions are the cargo owner, shipping line and 3PL. The party that has the power to decide can differ on a case-by-case basis. Though some differences in port selection criteria are said to exist between the parties, overall the literature seems to agree that costs, efficiency, location, connectivity, risks, the features of the terminal and customer relations are the main port selection criteria used by the key players in the port selection process. Though the total carbon footprint of the supply chain is mentioned in the literature as a port selection criterion, it was not indicated to be an important selection criterion in the

academic literature that consulted key players. Table 1 shows an overview of the port selection criteria mentioned in the academic literature review.

Table 1: Selection criteria mentioned in reviewed academic literature per key player

| <b>Criteria</b>                                 | <b>Cargo owners</b> | <b>Shipping lines</b> | <b>3PLs</b> |
|---|---------------------|-----------------------|-------------|
| <b>Costs</b>                                    |                     |                       |             |
| Supply chain total cost                         | X                   |                       |             |
| Switching costs                                 | X                   |                       |             |
| Port costs                                      |                     | X                     |             |
| Handling costs                                  |                     | X                     |             |
| Costs of services to port                       |                     |                       | X           |
| <b>Efficiency</b>                               |                     |                       |             |
| Port (operational) efficiency                   | X                   | X                     | X           |
| Efficiency of supply chain interfaces and links | X                   |                       |             |
| <b>Location</b>                                 |                     |                       |             |
| Origin or destination of cargo                  | X                   | X                     |             |
| Availability of cargo                           |                     | X                     |             |
| Proximity to import/export areas                |                     | X                     |             |
| Proximity to main navigation routes             |                     | X                     |             |
| Geographic location of the port                 |                     | X                     | X           |
| <b>Connectivity</b>                             |                     |                       |             |
| Hinterland connections                          | X                   | X                     | X           |
| Level of supply chain coordination              | X                   |                       |             |
| Feeder network                                  |                     | X                     |             |
| Shipment information                            |                     |                       | X           |
| Frequency and quality of shipping service       |                     |                       | X           |
| Accessibility of markets                        | X                   |                       |             |
| <b>Risks</b>                                    |                     |                       |             |
| Route risk mitigation                           | X                   |                       |             |
| Delays  | X                   |                       |             |
| Damages   | X                   |                       | X           |
| Reliability                                     |                     | X                     |             |
| <b>Terminal features</b>                        |                     |                       |             |
| Terminal capacity                               |                     | X                     |             |
| Maximum allowable draft                         |                     | X                     |             |
| Equipment availability                          |                     |                       | X           |
| Flexibility and ease of use                     | X                   |                       |             |
| <b>Customer relations and marketing</b>         |                     |                       |             |
| Speed of responding to new needs and requests   |                     | X                     | X           |
| Personal contacts                               | X                   |                       | X           |
| Tradition/experience                            | X                   |                       | X           |
| <b>Marketing</b>                                |                     |                       |             |
| Port's marketing efforts                        | X                   |                       |             |
| <b>Environmental impacts</b>                    |                     |                       |             |
| Carbon footprint of the supply chain            | X                   |                       |             |

All key players in the port selection decision regard quality as more important than the price charged for port services. This relates to the fact that port services are increasingly selected based on their 'fit' with the total supply chain for the shipment. In that sense the direct costs of the port services is less important for port selection decision, than the effect that the port selection can have on the overall costs and quality of the supply chain. In sum, reducing the amount of 'drag', in the form of added costs, delays and damages, throughout the supply chain when the cargo moves from production to consumption. Therefore criteria that reduce this 'drag' for the total supply chain are the main selection criteria in ports. These criteria are strongly influenced by the quality and costs of the logistics service providers offering services to, from and in the port.

Unfortunately most of the studies on port selection are based on the stated preferences of shipping lines, 3PLs and cargo owners. This stated preference does not always coincide with actual behaviour and little information is available about the actual decision making process. Examples show that certain criteria can be decisive in specific situations, while they are not mentioned in most studies on port selection criteria.

### **3 Environmental initiatives by retailers**

Within the academic literature there is little proof of the extent to which environment-related issues are currently used as port or supply chain partner selection criteria.

Therefore, this chapter focuses on the information that cargo owners have made public, as an indication of their interest and the overall importance they attribute to environmental issues. As mentioned in the introduction, the focus is on retailers, because they are responsible for a large part of container imports into North America.

Retailers are looking beyond their own organizational boundaries to find opportunities to reduce costs, increase quality of their services to their customers and improve their social and environmental performance (Ganesan et al., 2009). This is due to the fact that customers are demanding “more for less” on one hand, but on the other hand are becoming more aware of the environmental and social issues associated with the products that they buy (Ganesan et al., 2009).

According to Chroust (2011), retailers increasingly attempt to increase the efficiency of their operations and reduce their environmental impacts by ‘greening’ their supply chains. They have discovered that ‘green’ operations can lead to cost savings and they have experienced an improvement in their brand reputation. Large retailers like Wal-Mart and IKEA have the power to demand changes and implement policies in their supply chains outside their organizational boundaries (Dauvergne & Lister, 2010).

A survey performed by *American Shipper* among 200 transportation buyers showed that overall 38% of the responding cargo owners already ask logistics service providers for a sustainability plan before they do business with these service providers. When looking at companies with revenues greater than US\$1 billion, this figure increases to 47% of the respondents (Blaeser, 2011). The findings show that environmental performance is currently an issue for especially large retailers and also suggest that this focus on ‘green’ will not diminish in the future. However, the literature provides little information on which specific issues are included in this focus on ‘green’ and which of these issues could be relevant in relation to their supply chain decisions.

In order to determine what environmental issues large retailers take into consideration, the environmental initiatives of the top 5 importers into the U.S.<sup>10</sup> are described below. Together these companies represented 11% of the total amount of TEUs imported into the U.S. in 2010<sup>11</sup>. These companies are shown in table 2.

Table 2: Top 5 importers into the U.S. in 2010

| Nr | Company          | Imported TEU |
|----|------------------|--------------|
| 1  | Wal-Mart Stores  | 696,000      |
| 2  | Target           | 455,500      |
| 3  | The Home Depot   | 286,700      |
| 4  | Lowe's Companies | 221,600      |
| 5  | Sears Holdings   | 212,800      |

Source: Journal of Commerce (JoC), 2011a

None of these companies provide information on their websites regarding whether or not they have an EMS in place and if this system is certified. However, they have developed environmental policies and initiatives, which are discussed below.

### 3.1 Wal-Mart Stores

Wal-Mart Stores (Wal-Mart) imported 696,000 TEU into the U.S. in 2010, making it the largest importer in that year (JoC, 2011a). This U.S. multinational corporation runs chains of large discount department stores and warehouse stores.

Wal-Mart has developed its own Sustainable Product Index, which has three steps. The first step is the 'Supplier Sustainability Assessment', the second step is the 'Lifecycle Analysis Database' and the third step is 'A simple tool for customers'. Wal-Mart expresses in its Global Responsibility Report 2011 (Wal-Mart, 2011) that they are working globally with numerous suppliers to fill out the Supplier Sustainability Assessment. Wal-Mart also established a Sustainability Consortium, which is developing the methodology and tools that will eventually lead to the Sustainable Product Index.

Wal-Mart's Sustainability Assessment was first introduced in 2009 and is also used by Wal-Mart in Canada. The assessment is a voluntary tool to gain information about

<sup>10</sup> Quantitative information on container imports to North America by large retailers is only publicly available concerning imports into the U.S. and not into Canada.

<sup>11</sup> This is based on total import figures for the U.S. provided by the Journal of Commerce (2011a) and the import figures per company provided by the Journal of Commerce (2011b)

environmental and social policies of current and potential suppliers. Most of Wal-Mart's main suppliers cooperate with the retailer on Wal-Mart's sustainability policy and a Quality Digest article (Carey, 2009) mentions that many of these suppliers were eager to become members of the group that oversees the implementation of this sustainability index. No public information was found to determine if logistics service providers have also been included in Wal-Mart's sustainability assessment.

As mentioned in the introduction of this paper, Wal-Mart pledged in 2010 to reduce GHG emissions with 20 million metric tonnes by 2015, which will include reducing the amount of GHG emitted by transport activities (Wal-Mart, 2010). This is part of Wal-Mart's long-term goal to become a zero emissions and waste company.

Wal-Mart is also one of the partners in the Clean Cargo Working Group (CCWG)<sup>12</sup>, which is a global business-to-business initiative among retailers, manufacturers, ocean carriers, and logistics providers. It creates tools for measuring and reducing the environmental impacts<sup>13</sup> of global goods transportation (BSR, 2011a). The company is also a member of the U.S. Environmental Protection Agency (EPA) SmartWay Partnership (SmartWay). This is a voluntary program in the U.S. aimed to reduce the environmental and health impacts of transport. Retailer participants commit themselves to use SmartWay participating trucking or rail carriers for 50% of their cargo transported in the U.S. and carriers have to assess their environmental performance and set goals for improvement<sup>14</sup>.

Wal-Mart makes no secret of the fact that many of its environmental initiatives have also lead to considerable cost reductions for the company. For many initiatives described in its Global Responsibility Report (Wal-Mart, 2011) Wal-Mart mentions both the emissions and cost reductions it has achieved.

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<sup>12</sup> Further information on the CCWG is provided in section 7.1.

<sup>13</sup> The environmental performance assessment tool developed by the CCWG includes information on CO<sub>2</sub>/SO<sub>x</sub>/ NO<sub>x</sub> emissions, waste/water/chemicals management, Environmental Management Systems used, and transparency (BSR, 2011a).

<sup>14</sup> A further explanation of the SmartWay partnership is provided in section 7.2.



### 3.2 Target

Target is the second largest importer in terms of imported TEUs into the U.S., which totalled 455,500 in 2010 (JoC, 2011a). Target is an U.S. based retailer and a direct competitor of Wal-Mart.

Target states in its Corporate Responsibility Report 2009, that stewardship in environmental responsibility is one of the most important elements of Target's corporate reputation. For the company 'stewardship' means that it has to take measures to reduce its environmental impacts, that go beyond what is legally required (Target, 2010). The potential benefits of environmental measures in terms of cost and risks reduction or business opportunities are evaluation criteria before implementing environmental initiatives (Target, 2010)

Target has set goals and implemented measures to reduce waste, water usage and energy usage. The company first measured its CO<sub>2</sub> footprint in 2005 using the Greenhouse Gas Protocol created by the World Resources Institute and intends to reduce its CO<sub>2</sub> emissions per square foot of store area by 10% by 2015 compared to 2007.

Transportation is one of the activities of which Target intends to reduce CO<sub>2</sub> emissions. Target does not own or operate the transportation fleets that transport its products, but they cooperate with carriers in order to encourage efficient transportation practices. Examples of such practices include a more efficient way of routing cargo, the use of different transportation modalities and improvement of load factors.

Target has been a member of the SmartWay partnership since 2008 and it is one of the founders of the Coalition for Responsible Transportation<sup>15</sup> (CRT). Both partnerships focus on reducing the environmental and health impacts of terrestrial transport in the U.S. (Target, 2011).

### 3.3 The Home Depot

In 2010, The Home Depot (Home Depot) imported 286,700 TEUs into the U.S. and was third largest importer into the country in terms of TEUs (JoC, 2011a). It is a U.S. multinational retailer of home improvement, construction products and services.

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<sup>15</sup> More information on SmartWay and CRT is provided in section 7.3.

Home Depot has pledged to reduce its CO<sub>2</sub> emissions by 20% by 2015 compared to its 2004 emissions per square foot store usage. This reduction only applies to their U.S. supply chains and only includes emissions that are under direct control of the company, but excludes emissions in the supply chain emitted by contracted parties (Home Depot, 2010).

Although the emission of its suppliers is not part of the CO<sub>2</sub> emission reduction target, Home Depot is establishing a Supplier Advisory Board in the U.S. This Board will set criteria and develop a process to evaluate the sustainability performance of suppliers (Home Depot, 2010). Currently there is no public information provided by Home Depot on the status of this initiative or on the scope of activities included in the Board's mandate.

With regard to the environmental footprint of transport generated through its operations, Home Depot reports that in the U.S. 97% of the transportation companies that it contracts are partners of the SmartWay program (Home Depot, 2010).

In Canada, Home Depot measures its GHG emissions and operational changes at the store level have resulted in a reduction of 220 million kWh of energy usage since 2005. Other initiatives include providing more sustainable product options to consumers, recycling programs, the introduction of a sustainable wood purchasing policy and donation of funds and products to community projects through the Home Depot Canada Foundation (Home Depot, 2011). However, no mention of the environmental impacts of transport or supply chain decisions is made on the website of Home Depot in Canada.

### **3.4 Lowe's Companies**

Lowe's Companies (Lowe's) imported 221,600 TEU in 2010 and was the fourth largest TEU importer into the U.S. (JoC, 2011a). It is a U.S. multinational chain of retail home improvement and appliance stores.

Lowe's has also developed initiatives to reduce its environmental impacts. These include offering customers more energy efficient products, building more energy efficient stores and sourcing sustainable wood. With regards to transport, Lowe's has also taken steps to address the environmental impacts of its operations. Since 2005, the company

participates in the EPA SmartWay partnership and all carriers that Lowe's uses in the U.S. are also participants (Lowe's, 2011).

Lowe's is a member of the CRT and was actively involved in the CRT's Clean Trucks Initiative, which was launched by the CRT to reduce truck-related GHG emissions at ports. Lowe's is helping to develop clean-truck incentive programs at ports in Virginia, North Carolina, South Carolina and Georgia. The company cooperates with other cargo owners, ocean and motor carriers, truck manufacturers and port authorities in those states (Lowe's, 2011).

Lowe's Canadian website makes no mention of environmental initiatives or any plans to develop these in the future.

### **3.5 Sears Holdings**

Sears Holdings (Sears) imported 212,800 TEU into the U.S. in 2010, making it the fifth largest importer in terms of imported TEUs (JoC, 2011a). This company is a multinational U.S. retailer with both full-line and specialty retail stores in the U.S. and Canada (Sears, 2011a).

Sears is in the process of assessing its GHG emissions. This will include both GHG emissions under its direct control and indirect emissions (Sears, 2011b). It does not make explicit what the geographical and operational scope is of its GHG emissions disclosure project.

Sears also participates in the EPA SmartWay program and the Port of Los Angeles' Clean Truck Program. According to Sears, most of the trucking carriers it uses in the U.S. participate in the SmartWay Transport program and 60% of transport miles directly controlled by Sears are covered by rail (Sears, 2011b).

Sears Canada has published its Corporate Social Responsibility policies on its corporate website. The requirements concerning environmental impacts of its suppliers do not go beyond local regulations<sup>16</sup>, though it does encourage suppliers to do more to reduce environmental impacts. Sears Canada makes no mention of policies regarding the environmental impacts of transport (Sears, n.d.).

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<sup>16</sup> "Vendors must comply with all local laws protecting the environment. Sears Holdings Corporation encourages its vendors to conduct business so as to minimize the impact on the environment, including reducing waste and maximizing recycling initiatives" (Sears, n.d.).

### 3.6 Conclusion retailers

Based on the literature and examples shown in this chapter, it can be concluded that the largest retail importers take measures to reduce the environmental impact of their operations. Many of the retailers included in this section clearly state that the main drivers for implementing environmental initiatives are both to decrease the environmental impacts, while improving business performance.

The environmental initiatives that are implemented by the largest importing retailers in the U.S. cover a broad array of environmental issues. These issues cover both the environmental impacts of using products as well as the impacts caused by the whole supply chain of the products. Cooperation with suppliers has become an important element for these retailers in order to tackle environmental issues in the supply chain.

Transportation is one of the aspects for which the largest importing retailers have taken measures to reduce the environmental impacts. The main focus of the environmental impacts of transportation is GHG emissions. The retailers included in this section mostly outsource transportation, which is why they cooperate with their service suppliers on environmental issues. The SmartWay partnership in particular is an important initiative due to the large-scale participations by both retailers and carriers participate. Modal-shifts and routing adjustments are also requested by retailers in order to reduce environmental impacts.

With regards to transportation to and from ports, the CRT is an initiative in which cargo owners, carriers and ports cooperate to reduce the environmental impacts of transport to and from ports.

Though ports and cargo owners are cooperating in the U.S. on environmental issues, the retailers included in this chapter make no mention on their websites (as of July 2011) that the environmental performance of ports will directly influence their port selection decisions.

#### **4 Environmental initiatives by shipping lines**

Shipping lines are increasingly trying to reduce the environmental impact of their operations while enhancing their performance (Lai et al., 2011). Many shipping lines consider ‘green shipping practices’ to be essential for sustaining the development of the industry. The necessity of these ‘green’ shipping practices is the result of cargo owners increasingly requiring shipping firms to be more environmentally responsible when handling their shipments. The adoption of green practices is also the result of increasing social pressure through regulatory requirements, or the threat of more stringent regulations being implemented (Lai et al., 2011). Another driver for more sustainable practices by the shipping lines is the increase in fuel prices, which have stimulated shipping lines to find methods to transport cargo more fuel efficiently (Notteboom & Vernimmen, 2009).

The International Maritime Organisation is currently in the midst of establishing industry rules to address GHG emissions of ships and has already developed the Energy Efficiency Design Index (EEDI); a voluntary method of comparing the effectiveness in terms of GHG emissions of cargo transporting ships (IMO, 2011). Ship owners can use the EEDI to market the environmental performance of their ships (Corbett, 2010).

Regulations, customer demand, increased fuel prices and the potential for gaining a competitive advantage have stimulated the shipping industry to reduce their environmental impact. The top five shipping lines, in terms of fleet container capacity, are analyzed in order to determine what environmental initiatives container shipping lines are developing and implementing. Together these shipping lines represent 45% of the global supply in container shipping capacity (Alphaliner, 2011).

Table 3 provides an overview of the top five shipping lines in terms of container capacity.

Table 3: Top 5 Shipping lines in July 2011

| Nr | Company                        | Capacity (TEU) |
|----|--------------------------------|----------------|
| 1  | APM-Maersk                     | 2,395,975      |
| 2  | Mediterranean Shipping Company | 2,000,715      |
| 3  | CMA CGM Group                  | 1,288,883      |
| 4  | Cosco Container Line           | 623,419        |
| 5  | Hapag-Lloyd                    | 619,401        |

Source: Alphaliner, 2011

#### 4.1 APM-Maersk

APM-Maersk (Maersk) has a container fleet capacity of 2,395,975 TEU and this represents 15.4% of the total market capacity. It is the largest container shipping line in terms of TEU capacity (Alphaliner, 2011)

The scale of the company also causes it to be faced with external pressure, for example from NGOs, to reduce the company's environmental impacts. Pressure also comes from Maersk's customers, because an estimated 40% of Maersk's business is tied to contracts arranged directly with the cargo owner (Joynson, 2011). This means that environmental initiatives such as those by Wal-Mart may also impact Maersk. As a result of this pressure Maersk has integrated sustainability into its business strategy and customer value proposition and considers sustainability to serve as a means of market differentiation. In 2010, the management team declared that environmental sustainability would be one of the company's top three future differentiators (BSR, 2011b).

Recently Maersk published a manifesto about the need for change in the shipping industry. In this manifesto Maersk expresses that "If we take proactive action we will have an opportunity to help set the standards ... then customers will be able to make decisions with open eyes between the carbon footprints caused by carriers in their supply chains" (Maersk, 2011, p24). This suggests that Maersk is of the opinion that the environmental impact of choosing a certain shipping line will become a selection criterion for cargo owners.

Maersk's EMS was ISO 14001 certified in 2003 and Maersk pays attention to a wide array of environmental impacts of its shipping operations. This includes, for example, ballast water treatment, energy usage reduction, the use of more environmentally friendly

refrigerated containers and the use of sustainable wood types for container floorboards (Maersk, 2008).

Apart from environmental initiatives and policies for its own operations, Maersk has also established environmental requirements for terminals (Maersk, 2008) but not meeting these requirements does not mean that Maersk switches easily to another terminal. If terminals and ports do not meet Maersk's standards, the company has teams that can assist terminals and ports to improve their processes. Currently this is mostly used to address efficiency issues, but the CEO of Maersk line, Eivind Colding, recently expressed in an interview with Port Technology International (PTI) (2011) that he wants to include environmental issues in the discussions with the terminals. The main reason for this is not so much the environmental performance of the terminals themselves, but more so the effect that the terminal's operational performance has on the entire supply chain. For example a ship might have to increase its speed to make up for a delay at the terminal. This increased speed requires more fuel and therefore has a negative impact on the environment (PTI, 2011).

In recent years Maersk developed a new tool, which can show customers the estimated carbon footprint of their door-to-door supply-chain. In addition to calculating a customer's carbon footprint, Maersk also offers a consulting service aimed at identifying the potential reduction of carbon emissions (Maersk, 2008).

Maersk participates in a number of international partnerships that address environmental issues related to shipping. These partnerships include CCWG, the Sustainable Shipping Initiative<sup>17</sup> (SSI), a group of 17 organizations that are developing an action plan to make the shipping industry sustainable, and the CRT. The company also participates in several voluntary clean fuel programs, for example in the Ports of Seattle and Port Metro Vancouver (Mongelluzzo, 2011).

#### **4.2 Mediterranean Shipping Company**

Mediterranean Shipping Company (MSC) has a container fleet capacity of 2,000,715 TEU. This represents 12.9% of the total container fleet capacity and makes MSC the second largest container shipping line (Alphaliner, 2011).

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<sup>17</sup> This initiative is explained in section 7.4.

On the corporate website of MSC no mention is made of environmental initiatives or policies. This does not necessarily mean that MSC does not undertake initiatives to reduce their impacts on the environment, but the company provides no public information.

A recently published index by SeaIntel<sup>18</sup> revealed that MSC is one of the container shipping lines that showed the weakest performance with regards to environmental issues compared to its competitors. The index takes numerous factors into account, including carbon efficiency of carrier's fleet, participation in major environmental initiatives, issuance of regular environmental reports and whether carrier provides customers a carbon calculator (American Shipper, 2011).

Although MSC has a relatively weak environmental performance compared to its competitors, it does participate in the CCWG, which shows that it has an interest in reducing the environmental impact of the shipping industry (BSR, 2011a).

### **4.3 CMA CGM Group**

CMA CGM Group (CMA CGM) is the third largest container shipping line and has a fleet capacity of 1,288,883 TEU. This represents 8.3% of the global container fleet (Alphaliner, 2011).

Several years ago, CMA CGM developed its global environmental strategy and established an Environment Committee to lead this initiative. The strategy aims to integrate the reduction of environmental impacts into the corporate strategy of CMA CGM. For this reason several objectives have been developed concerning GHG emissions, air quality, impact of shipping on the marine environment, 'greener' services and the internal culture of company. In order to meet its environmental objectives, CMA CGM has invested in cleaner technologies for its newest ships, especially regarding fuel efficiency. Ships that have been or will be delivered between 2009 and 2012 are equipped to connect to shore power when this is available at a port. This enables them to shut-off their generators while at ports and thereby reduce their fuel consumption and GHG emissions (CMA CGM, n.d.).

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<sup>18</sup> Unfortunately the budget for this graduate project was not sufficient to cover the 550 Euro that SeaIntel requires for its report on the environmental performance of shipping lines.



Further actions include the use of low sulphur fuel in order to reduce sulphur oxide emissions, investment in lighter containers and the use of environmentally sustainable wood. CMA CGM also cooperates on environmental issues through international partnerships, such as the CCWG and the CRT (CMA CGM, n.d.).

#### **4.4 Cosco Container Line**

Cosco Container Line (Cosco) is the fourth largest container line in terms of TEU capacity. Its total fleet capacity is 623,419 TEU, which represents 4% of global capacity (Alphaliner, 2011).

Cosco has implemented a strategic approach towards sustainability and made its strategy operational through the use of balanced scorecards for its divisions. With regards to environmental impacts, these scorecards require information on, amongst others, exhaust gasses, energy and water usage and biodiversity protection. The latter mainly relates to compliance with IMO regulations concerning anti-fouling paints and ballast water management. In relation to exhaust gases and energy usage, the shipping line has taken measures to improve fuel efficiency, such as slow steaming. It also participates in the At-Berth Clean (ABC) Fuel Program of the Port of Seattle<sup>19</sup> and in the Green Flag Initiative of the Port of Long Beach, a voluntary vessel speed reduction program.

The shipping line does not make any statements regarding environmental performance goals, for example GHG emission reduction, in its Sustainable Development Report 2009. Cosco did implement an EMS, which is ISO 14001 certified (Cosco, 2010). This requires the company to set goals to reduce environmental impacts (ISO, 2011), but does not require the ISO 14001 certified companies to make these goals public.

#### **4.5 Hapag-Lloyd**

Hapag-Lloyd is the fifth largest container shipping line and operates a fleet with a capacity 619,401 TEU, equalling 4% of the global container capacity (Alphaliner, 2011). In 2010 it transported 4.9 million containers (TEU).

In 2003 Hapag-Lloyd's EMS received an ISO 14001 certification and all of Hapag-Lloyd's sustainability activities, including the environmental protection measures, are

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<sup>19</sup> More information on the ABC Fuel Program of the Port of Seattle is provided in chapter 6

coordinated and managed in the Sustainability Management department (Hapag-Lloyd, 2011).

Hapag-Lloyd has formulated several objectives concerning their environmental performance. These objectives include, among others, to minimize impact on marine flora and fauna and to reduce GHG emissions along the transport chain. In order to achieve these objectives, Hapag-Lloyd has invested in cleaner and more efficient technologies and adjusted operational practices to lower vessel fuel and energy consumption.

Hapag-Lloyd is also a participant of the CCWG and it cooperates with several ports in local environmental initiatives. This includes the At Berth Clean Fuel Program of the port of Seattle, the EcoAction Program of the Port Metro Vancouver and the Port of Long Beach's Green Flag Program (Hapag-Lloyd, n.d.).

#### **4.6 Conclusion**

The examples of the top five shipping lines show that almost all these companies have taken a strategic approach to address their environmental performance. They have developed environmental strategies and established committees or departments within their companies to oversee their environmental initiatives and performance. The investments in 'greener' ships further shows the long-term commitment of most of these shipping lines to improve their environmental performance, but also to improve their business performance.

Shipping lines attempt to improve their business performance by increasing the efficiency of their operations. Especially fuel efficiency is an important element for them, because of the increasing fuel prices. The combination of reducing environmental impacts and reducing costs is one of the main reasons that shipping lines to explore and invest in ways to increase the efficiency of their shipping operations.

Other important reasons for 'greening' their shipping operations are the more stringent environmental regulations and the threat of more regulations being implemented. Apart from reducing costs and environmental regulation, some shipping lines foresee that their environmental performance could become a selection criterion for customers. For example, Maersk is actively promoting its environmental initiatives and

marketing it as a competitive differentiator. However, this shipping line is 'ahead of the pack' in its marketing efforts and other shipping lines do not yet use their environmental performance as a competitive differentiator. Widespread adoption of the IMO's EEDI could increase the competition between shipping lines based on their environmental performance.

Improving the environmental performance of shipping operations in ports is mainly the result of port and government initiatives. For example, many shipping lines participate in voluntary programs established by ports, to reduce air pollution in port areas. In all cases the additional costs for the shipping lines to reduce their emissions, is partly offset by the ports, either in the form of lower harbour dues or reimbursements.

Apart from cooperating in voluntary programs of ports, the shipping lines included in this chapter also participate in international partnerships that address the environmental impacts of shipping. For example CMA CGM participates in the CRT together with trucking companies, cargo owners and ports.

Although there is cooperation between shipping lines and ports on environmental issues, no evidence has been found that the environmental performance of ports is considered to be a selection criterion for shipping lines. The example of Maersk shows that if shipping lines would pay increased attention to the environmental performance of ports, they are more likely to try to improve the performance of a port that does not meet requirements than to move to another port. This shows that other criteria than environmental performance are considered more important.

## **5 Environmental initiatives by 3PLs**

A survey in 2008 and one in 2009 of respectively 39 and 35 CEOs of 3PLs in Europe, North America and Asia-Pacific showed that more than 70% of respondents had environmental sustainability programs in place (Lieb & Lieb, 2010). The main reason for these programs was, based on the responses of the participating CEOs, the desire “to do the right thing”. Increased pressure from customers was also mentioned as an important motive to establish environmental initiatives, because approximately 20% of their current and potential customers posed questions concerning the environmental performance of 3PLs. These questions concerned the operational practices of the 3PLs themselves, but also the potential assistance the 3PLs could provide reducing the environmental impacts of their customers. The eight case studies of European 3PLs included in the research of Evangelista et al. (2011) showed that the customers of 3PLs are one of the main drivers for environmental initiatives.

Though 3PL customers have shown an increased interest in environmental issues, these issues have not become a major 3PL selection criterion according to the CEOs participating in the 2008 survey (Lieb & Lieb, 2010). Another possible reason why customer interest in the wellbeing of the environment is not the main reason for 3PLs to implement environmental initiatives is the lack of clear environmental requirements from customers (Evangelista et al. 2011).

The 2009 survey amongst 3PL CEOs, referred to by Lieb and Lieb (2010), showed that despite the global recession of 2008 and 2009, many large 3PLs increased their efforts into environmental initiatives and programs during that period. Most of these efforts related to the carbon footprint of their operations.

According to Lieb and Lieb (2010) 3PLs and their customers will face increasingly stringent environmental regulations and this will put pressure on the companies to operate ‘greener’ supply chains. This means that the environmental performance of individual 3PLs can become a significant differentiating factor in the (near) future.

The examples below are included to determine what environmental initiatives 3PLs are taking to differentiate themselves from competitors and attract more cargo. The

companies included in the examples represent the world's largest ocean transport 3PLs in terms of TEUs. Table 4 shows an overview of these companies.

Table 4: Top 5 ocean freight 3PLs in 2009

| Nr | Company                                | Million TEU       |
|----|--|-------------------|
| 1  | DHL Logistics                          | 2.6               |
| 2  | Kuehne & Nagel                         | 2.5               |
| 3  | DB Schenker                            | 1.4               |
| 4  | Panalpina World Transport              | 1.1               |
| 5  | Expeditors International of Washington | 0.9 <sup>20</sup> |

Source: DHL, 2010; Logistics Quarterly, 2011

### 5.1 DHL Logistics

DHL Logistics (DHL) is a German freight forwarder, carrier and supply chain management service provider the largest global ocean freight forwarder in terms of TEUs. In 2009, it arranged for the transport of 2.6 million TEU ocean freight (DHL, 2010).

DHL considers environmental protection as one of its responsibilities as well as a business opportunity. This is reflected in its environmental program 'GoGreen', which focuses on the internal operations of DHL and on providing environmental services to customers called GoGreen Services (DHL, 2011).

With regard to the internal operations of DHL, its EMS covers management of aspects such as the use of water, energy and the production of waste, noise and air pollution and is in compliance with ISO 14001 standards (DHL, 2011).

As part of the GoGreen program, DHL will improve its CO<sub>2</sub> efficiency<sup>21</sup> and that of its transportation subcontractors by 30 % by 2020, compared to the 2007 baseline. In 2010, DHL established a dedicated CO<sub>2</sub> accounting and controlling department. In the same year its reporting of climate data and GoGreen program ranked 2<sup>nd</sup> in the 2010 Global 500 Carbon Disclosure Leadership Index (DHL, 2011).

DHL has also developed initiatives to specifically deal with environmental impacts of ocean transport. It has implemented a carrier scorecard, which enables DHL to regularly

<sup>20</sup> 2008 figure (retrieved from DHL, 2010)

<sup>21</sup> This means not an absolute reduction of CO<sub>2</sub> emissions, but DHL does not explain in its environmental policy how it will measure 'efficiency'.

monitor the efficiency improvement of the carriers it uses. The carrier's emission factors are weighted by trade lane, forwarding volume and load factors. This information is translated into a virtual cost of carbon. The monitoring is applied to strategic partners and gathered information is used as one of the supplier management KPIs (DHL, 2011). The DHL website makes no mention of which shipping lines participate in DHL's monitoring program.

DHL has performed research into the requirements of its customers and found that they are increasingly asking for 'green' solutions. In response to these requirements DHL developed a GoGreen product portfolio, including CO<sub>2</sub> emission reporting services, consultancy services to assist clients reduce CO<sub>2</sub> emissions and the possibility for clients to offset CO<sub>2</sub> emissions caused by DHL's services (DHL, 2011).

Regarding partnerships on environmental issues, DHL is also a member of the CCWG, SmartWay program and several other initiatives. It also works with politicians to find solutions for issues surrounding CO<sub>2</sub> emissions and supports market-based approaches, such as the inclusion of air transport in the European Emission Trading Scheme (ETS) in 2012 (DHL, 2011).

## **5.2 Kuehne & Nagel**

Kuehne & Nagel (K&N) is a Swiss company engaged in worldwide freight forwarding and supply chain management activities. K&N is the second largest ocean freight forwarder, handling over 2.5 million TEU per year (Logistics Quarterly, 2011).

K&N has developed an environmental strategy that includes measures to ensure the efficient use of capacity for all modes of transport, for example by bundling cargo flows at logistics hubs. The strategy also includes other actions to reduce the environmental impacts of the company, for example the deployment of multi-modal traffic via rail and river barges and the reduction of energy use in their new logistics centres through environmentally friendly technologies (K&N, n.d.). K&N makes clear that its focus on efficiency in the supply chain is aimed at reducing both emissions and costs.

Apart from reducing the environmental impacts of its own operations, K&N also offers its customers a carbon management program designed to calculate their carbon footprint for their door-to-door supply chain. The goal of the program is to identify

carbon reduction possibilities in supply chains. K&N believes that the need to reduce carbon emissions is increasingly becoming a major criterion in the selection of business partners and it is currently undertaking a survey in order to get a better understanding of the requirements concerning environmental issues of their (potential) customers (K&N, n.d.). K&N has also partnered with companies such as Wal-Mart, Maersk and CMA-CGM by joining the CCWG (K&N, n.d.).

### **5.3 DB Schenker**

DB Schenker Logistics (Schenker) is a German company that provides freight forwarding and supply chain management services around the world. In 2009, it shipped 1.4 million containers (TEU) making it the third largest freight forwarder in terms of ocean freight (Logistics Quarterly, 2011).

One of the goals of Schenker is to become a “leading provider of Green Logistics services” (Schenker, n.d.). Based on the information provided on the corporate website of Schenker, for the company ‘green logistics’ mainly involves reducing GHG emissions.

According to Schenker, its customers have become more and more interested in green logistics, however their willingness to pay a higher price to reduce environmental impacts so far has been limited. Therefore, Schenker aims to optimize the customer’s transport chain both from an economic and environmental perspective, which it does by focusing on efficiency in the supply chain (Schenker, 2011a).

Apart from setting CO<sub>2</sub> reduction targets and reducing its own CO<sub>2</sub> emissions, Schenker launched its ‘Eco Plus’ solutions in 2011. This product line was developed to assist its customers to reduce their CO<sub>2</sub> emissions throughout the supply chain. Schenker developed a tool to calculate the supply chain CO<sub>2</sub> emissions of its customers and, based on the results, offers advice on how to reduce those emissions. This advice may be changing parts of the route or using different modes of transportation (Schenker, 2011a).

Schenker’s ‘Eco Plus’ solutions include the product Eco OceanLane. This means that Schenker can shift non-time critical cargo to ocean services that operate at lower speeds. According to Schenker, this can result in a strong reduction of CO<sub>2</sub> emissions (Schenker, 2011b). As more and more shipping companies have implemented ‘slow steaming’

policies as a response to shipping capacity oversupply and increased fuel costs, it appears that Schenker is marketing these policies as 'Eco OceanLane'.

The Eco Solutions product line also includes Eco Plus, which provides Schenker customers the possibility to select 'CO<sub>2</sub>-free' rail freight throughout Germany. Schenker claims that the energy required is completely provided by renewable resources. Apart 'CO<sub>2</sub>-free' rail transport (no information is provided on how rail transport is made CO<sub>2</sub> free), Schenker also offers Eco Neutral, which gives customers the opportunity to offset their CO<sub>2</sub> emissions by financing climate protection projects (Schenker, 2011a). The success of these offset solutions in terms of sales and environmental impact reduction is not indicated.

Schenker's EMS is ISO 14001 certified in 48 countries and it is planned that all worldwide operations will be certified by 2012 (Schenker, 2011c).

#### **5.4 Panalpina World Transport**

Panalpina World Transport (Panalpina) is a Swiss based global freight forwarder and supply chain service provider. It is the fourth largest 3PL in terms of ocean freight forwarding. It handled more than 1.1 million TEU in 2009 (Logistics Quarterly, 2011).

Regarding its environmental initiatives the Chief Operating Officer of Panalpina, Karl Weyeneth, stated "We as individuals and as members of a global player within the logistics industry, have a moral and civic duty to do everything possible to minimize the impact that our actions have on the Environment" (Panalpina, 2009).

Following this statement, Panalpina has taken several environmental initiatives, both within the company and in support of its customers. The main initiative was the launch of the PanGreen program in 2009. This program resulted in the ISO 14001 certification of all Panalpina offices and the implementation of an environmental statistical tool to measure and monitor key environmental data of Panalpina. This data includes the usage of paper, electricity, fuel and water. The tool is also used to calculate Panalpina's own CO<sub>2</sub> footprint. All offices have to report this data twice a year to the corporate head office (Panalpina, 2009). This data collection enabled Panalpina to set targets to reduce its environmental impacts, which it aims to achieve by the end of 2011 (Panalpina, 2011). Initiatives to reduce environmental impacts include constructing 'green' Panalpina



offices in Germany in order to reduce energy usage and contracting EPA SmartWay partner trucking companies in the U.S. (Panalpina, 2011).

In 2010, Panalpina developed a new tool that enables Panalpina to report its customers their total CO<sub>2</sub> emissions by mode of transport and KPIs for the overall CO<sub>2</sub> efficiency (Panalpina, 2011). Panalpina does not publicly communicate on its website if it uses this information to offer commercial consultancy services to their customers on how they could reduce their CO<sub>2</sub> emissions.

### **5.5 Expeditors International of Washington**

Expeditors International of Washington (Expeditors) is the fifth largest ocean freight forwarder, according to the 2008 market information (provided by DHL, 2010).<sup>22</sup> Its market share in ocean freight was 2.8% in 2008, which is approximately 0.9 million TEUs.

Expeditors has developed a sustainability strategy that is based on three pillars: social responsibility, environmental stewardship and health & safety. For each of these pillars a number of programs have been developed.

For the pillar ‘environmental stewardship’, Expeditors established a Global Environmental Steering Committee. The goal of this committee is to create awareness, develop environmentally friendly practices within the company and ensure a consistent approach. As part of this approach, local branch environmental teams have been established to execute Expeditors’ global environmental initiatives. These teams have been involved in determining Expeditors’ GHG emission base line in 2010. Expeditors will publish its GHG emissions in 2011 based on the World Resources Institute approach.

Though Expeditors does not own transport fleets itself, it does stimulate its transport service providers to reduce environmental impacts and has become a SmartWay partner. In 2010, 85% of Expeditors’ transport service providers were also SmartWay partners and Expeditors has expressed ambition to increase this number to 90% in the coming years.

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<sup>22</sup> Expeditors does not provide public information on their ocean shipments in terms of TEUs. DHL (2010) does provide this information for 2008 in its annual report, though it does not reference a source for this information.

Apart from the SmartWay initiative, Expeditors is also member of the CRT and has partnered with several clients concerning their GHG emissions. The 3PL measures the GHG emissions of its partners and provides solutions to reduce these emissions, thereby reducing expenses (Expeditors, 2011).

## 5.6 Conclusion

The academic literature shows clients of 3PL services are increasingly demanding 'green' solutions for their logistics service needs. This means that they are looking for solutions that reduce their environmental impact.

The largest 3PLs, in terms of ocean freight forwarding, have recognized this development and offer these 'green' solutions to their customers. Based on the examples included in this chapter, these products mainly focus on reducing CO<sub>2</sub> emissions and make little to no mention of any other environmental impacts. The reduction of CO<sub>2</sub> emissions can often be achieved through more efficient solutions for transport requests, which can also reduce costs. This 'win-win' aspect is often expressed on the websites of the 3PLs. The two largest 3PLs also offer their clients tools to calculate their CO<sub>2</sub> footprint and the opportunity to offset CO<sub>2</sub> emissions, which would increase costs. The success of these products, for example in terms of sales, is not publicly available on the websites or annual reports of the companies included in this chapter.

It appears that the 3PLs included in the examples take a strategic approach towards their environmental performance. Some have developed dedicated departments for environmental initiatives, performance and products and the influence of the attempt to reduce environmental impacts on day-to-day business is increasing.

A number of 3PLs include environmental aspects in the selection of carriers, for example by selecting SmartWay participating trucking companies. DHL and Schenker, the two largest 3PLs, also specifically address the environmental impacts of ocean transport. The environmental performance of shipping lines is already said to be one of the supplier management KPIs.

Apart from including environmental aspects in their product portfolio and carrier selection process, 3PLs also pay attention to the environmental impacts of their own operations. Most of the examples included in this chapter have an ISO 14001 certified

EMS, which requires them to set goals to improve their environmental performance. However, it does not mention any specific requirements to these goals in terms of scale and scope. These companies are also participants in industry initiatives to deal with environmental impacts.

Market developments, cost reduction and the desire to do the ‘right thing’ seem to be important drivers for the environmental initiatives developed by the 3PLs. The inclusion of air transport in the European Emission Trading System starting in 2012 is also a reason for 3PLs to improve their CO<sub>2</sub> measuring capabilities, either because they provide air transport services or because they expect more modalities to be included in an ETS in the future.

There is no indication that 3PLs use the environmental performance of a port as a selection criterion. Some do calculate the CO<sub>2</sub> footprint of their use of ocean transport, but they use the information on the average footprint per major trade lane. This means that when, for example, they look at shipping cargo from Rotterdam to New York they use the information on averages emissions on the trans-Atlantic trade lane between Europe and North America. The CO<sub>2</sub> emission of shipping to a specific port are not used nor is there an industry-wide accepted mechanism to calculate these emissions.

## 6 Environmental initiatives by ports

As stated in Chapter 1, environmental issues have become an important element of port management. According to Adams et al. (2009), the main reasons for ports to invest in solutions for environmental issues are regulatory compliance and court-ordered activities, where ports are forced to make investments in avoidance of further legal action. They also state that public support for seaports is increasingly recognized as an issue that needs attention from port management. This support is necessary to obtain the ‘social license to operate’. Ports need the ongoing approval or support of local communities, NGOs and the different levels of government in order to continue or expand operations. Environmental investment strategies can also be associated with direct economic benefits, such as tax reduction or exemption and subsidies (Adams et al. 2009)

Adams et al. (2009) conducted a survey amongst port operators in 2009 and received a response from three Canadian ports, two American ports and three European ports. The results showed that seven of these eight ports already had an EMS standard in place. The main reasons for implementing the EMS were related to regulatory issues and environmental protection. The ports were also asked which stakeholders expressed an interest in their EMS program. Seven from the eight responding ports indicated that NGOs, community groups and regulatory agencies were most interested. Comtois and Slack (2007) concluded from their research into the public statements of 800 ports concerning their environmental initiatives that port administrations must increasingly consider environmental factors in their business strategies as a result of concerns of customers and the communities in which they operate. However, with regard to the concerns of customers, Adams et al. (2009) show that port authorities themselves do not think that their environmental performance impacts the port’s competitiveness. This could be related to the fact that most key players focus on GHG emissions in relation to transport. The operations within the port add relatively little additional GHG emissions to the total of most transport chains that pass through the port<sup>23</sup> (Adams & Quinonez, 2009)

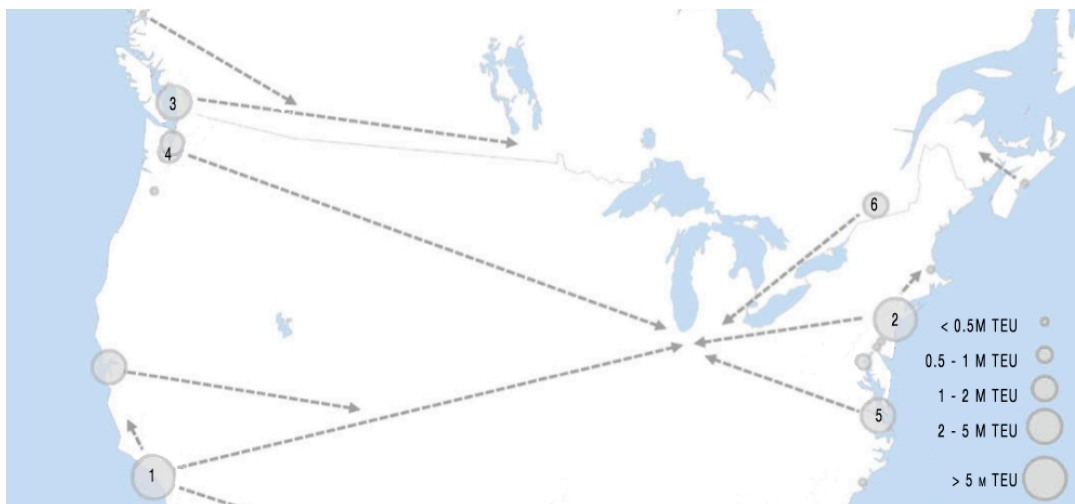
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<sup>23</sup> Adams and Quinonez (2009) use an example of the shipment of a TEU from Shanghai to Toronto via Halifax and show that the port operations would only add 4% to the total transport emissions (this excludes the emissions related to the production of the goods transported).

Perhaps a direct link between the ports' competitiveness cannot yet be established, but environmental initiatives can lead to cost reductions. Comtois and Slack (2007) note that the financial sector is more and more concerned about environmental sustainability. Merchant banks are implementing credit programs charging different interest rates to terminal operators corresponding with their environmental performance. Comtois and Slack (2007) state that some insurance companies already reduce the insurance premiums of firms that have a green certification. If the potential cost reductions offset the required investments in environmental initiatives, the lower costs can benefit the customer and service levels could be increased. Both could have a positive impact on the competitive position of a port.

The examples of ports included in this chapter are selected to determine what differences exist between environmental initiatives of ports competing for the U.S. Midwest. This region is chosen based on the number of ports that receive containers intended for the U.S. Midwest and the competition between these ports to attract containers. This competition could mean that these ports are looking for innovative ways to differentiate themselves and improving the implementation of environmental initiatives could be one of the methods used. Figure 3 shows the main ports competing for the U.S. Midwest and the numbers indicate which six ports have been selected to serve as examples in the chapter. These ports were selected to analyze a variety in size and location of ports spread throughout North America.

Figure 3: Main ports competing for the U.S. Midwest



Source: Modified from Rodrigue & Notteboom, 2010

The ports numbered one to six on the map are the examples included in this chapter. Table 5 shows the total TEU throughput in these ports in 2010 and the corresponding rank in comparison to other North American ports.

Table 5: Examples of ports competing for U.S. Midwest (2010 figures)

| Map # | Port                        | Throughput TEU M. | Rank in North America |
|-------|-----------------------------|-------------------|-----------------------|
| 1     | Port of Los Angeles         | 7.8               | 1                     |
| 2     | Port of New York New Jersey | 5.3               | 3                     |
| 3     | Port Metro Vancouver        | 2.5               | 5                     |
| 4     | Port of Seattle             | 2.1               | 7                     |
| 5     | Port of Virginia            | 1.8               | 8                     |
| 6     | Port of Montreal            | 1.3               | 13                    |

Source: American Association of Port Authorities (AAPA), 2011

Several other ports are shown in figure 4, but not included as examples. These ports include, amongst others, the Canadian ports in Halifax, Nova Scotia and in Prince Rupert, British Columbia. In 2010, the throughput in these ports was 0.4 million TEU and 0.3 million TEU respectively (AAPA, 2011).

### 6.1 Port of Los Angeles

The Port of Los Angeles (PoLA) had a throughput of 7.8 million TEU in 2010 (AAPA, 2011). In 2010 it was ranked the largest North American port in terms of TEU throughput.

The large amount of maritime and terrestrial traffic related to the PoLA has led to environmental impacts. The South Coast Air Quality Management District, a regional air quality regulatory agency, began to quantify the cost of this trade-related traffic in terms of exposure to cancer causing emissions and this showed that the chances of getting cancer were significantly higher in certain communities near PoLA. This resulted in legislative measures and environmental lawsuits against the port (Woudsma et al., 2009).

It was the legislative pressure that led to the development and implementation of the San Pedro Bay Ports Clean Air Action Plan (CAAP). This plan was adopted in 2006 by the governing boards of the ports of Los Angeles and Long Beach and committed the ports to reduce air pollution by at least 45% within five years. The PoLA met the goals in

2009, and in 2010 the CAAP was updated to set targets for a further reduction of air pollution for the period until 2015 (PoLA, 2011a).

The CAAP contains initiatives to reduce air emissions and lawsuits forced the PoLA to take certain measures. The use of shore power at the San Pedro Bay Port complex is the result of a lawsuit filed by the Natural Resources Defense Council (NRDC) against the PoLA over the planned construction of the China Shipping Terminal in 2000 in the PoLA. The lawsuit also resulted in a US\$10 million fund to clean up diesel trucks and it required the terminal to use yard equipment powered by cleaner burning fuels (Woudsma et al. 2009). This made the PoLA the first port to offer shore power to container ships (PoLa, n.d.).

As a result of the legal pressure, the port has adopted a ‘green growth strategy’, which foresees the expansion of port operations while reducing environmental impacts (PoLA, 2011a). One of the initiatives included in this strategy is the Clean Truck Program (CTP). As part of the CTP, all trucks that were built before 1994 are banned from the port and in 2012, all trucks that do not meet the 2007 Federal Clean Truck Emissions Standards (FCTE) will be banned. Truck owners are offered compensation for investments they have to make when participating in the CTP. In 2008 program participants could receive US\$20,000 for each FCTE-compliant truck used at the port and in total US\$44 million was paid to participants (PoLA, 2010).

In 2009 the PoLA also offered CTP participants funding for trucks that use Liquefied Natural Gas (LNG) or Compressed Natural Gas (CNG). Participants can receive a grant of US\$100,000 per new truck and the port aims for 1,000 LNG or CNG trucks to receive a grant. Port terminal operators and concessionaires can also receive up to 80% of the cost for each electric truck they purchase for terminal or drayage truck use (PoLA, 2010).

Other measures to reduce air pollution include the voluntary reduction of the speed of the ship and the required use of cleaner fuels by ships. This last measure is required by the State of California (2011).

As part of its ISO 14001 certified EMS, the port does not only address air pollution, but has also developed initiatives to address quality of water and natural habitats in the port area. The port has constructed a reef and salt marsh near the port and transplanted

giant kelp into the port. The PoLA also conducted a base-line biodiversity study in the port in 2005 (PoLA, 2011b).

On international level the PoLA participates in the World Ports Climate Initiative<sup>24</sup> (WPCI) and PoLA's Director, Geraldine Knatz, is Chair of this initiative (PoLA, 2011a).

## **6.2 Port of New York New Jersey**

The Port of New York New Jersey (PNYNJ) handled 5.3 million TEU in 2010. This makes it the third largest port in North America after the ports of Long Beach and Los Angeles (AAPA, 2011).

The PNYNJ has an ISO 14001 certified EMS and developed a Clean Air Strategy as part of its efforts to “preserve and protect the environmental resources of the New York and New Jersey region” (PNYNJ, 2009). This 10-year strategy was released in 2009 after an intensive stakeholder consultation process. The strategy aims to reduce the emissions of NO<sub>x</sub>, Particulate Matter and Volatile Organic Compounds by 3% annually compared to the 2006 baseline. The strategy also aims to reduce emissions by 5% annually compared to the 2006 baseline. Both targets are set for 10 years and are irrespective of the growth of the port. These reduction targets include the emissions of ocean-going vessels, cargo handling equipment, heavy-duty diesel vehicles, railroad locomotives and harbor crafts.

One of the actions taken to achieve these emission reduction goals is the promotion of low sulfur fuel use by the shipping lines. The PNYNJ offers shipping lines financial incentives<sup>25</sup> to use low sulfur fuel while in port. In 2011, US\$2.8 million is made available to finance the low sulfur fuel program (PNYNJ, 2010a).

Another action taken by the PNYNJ is the implementation of the Regional Truck Replacement Program. The program consists of the provision of grants and financing to eligible truck owners to help purchase newer, cleaner and more environmentally friendly trucks. The EPA has provided US\$8.6 million in grant funding and the PNYNJ has dedicated an additional US\$25.7 million in funds to provide qualified truck purchasers with low interest financing (PNYNJ, 2010b).

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<sup>24</sup> This initiative is explained in section 7.5.

<sup>25</sup> The Program reimburses ship operators 50% of the cost difference between using Low Sulfur Marine Fuel (=0.2%) and Intermediate Fuel Oil 380 in their main engines while operating within 20 nautical miles of the PNYNJ.



As part of the port's Green Ports Program, the PNYNJ has also established a Green Practices Task Force, in which 20 businesses in the port and port employees cooperate to identify green initiatives that address air and water quality, waste minimization and energy conservation. As a result, port tenants have voluntarily expanded recycling efforts, increased their use of floor drain and catch basin inserts to trap contaminants from runoff and rainwater, used less fuel and modernized cargo handling equipment. For example, the New York Container Terminal at Howland Hook and APM Terminal in New Jersey have purchased yard hostlers with customized hybrid technology to reduce emissions and improve fuel economy (PNYNJ, 2010c).

On an international level, the PNYNJ participates in the WPCI and signed an agreement to cooperate on environmental issues with the Port of Rotterdam in 2007 (EPA, 2010a).

### **6.3 Port Metro Vancouver**

The Port Metro Vancouver (PMV) handled 2.5 million TEU in 2010. In terms of container throughput, it was the fifth largest North American Port in 2010 (AAPA, 2011).

The PMV places information on its environmental policy and initiatives prominently on its website. According to the PMV, it is the first North American port to establish a dedicated team of specialists to address the port's environmental impacts. It has developed several initiatives to reduce these environmental impacts, such as the Air Action Program and the EcoAction program.

The Air Action Program includes the port's shore power initiative. In 2009, the PMV installed shore power for cruise ships, allowing ships to shut down their diesel engines and connect to the land-based electrical grid<sup>26</sup>. This made the PMV the first Canadian port to offer shore power to cruise ships (PMV, 2011a). The total investment of the shore power initiatives was CA\$9 million and was made by the Government of Canada, the British Columbia Ministry of Transportation and Infrastructure, Holland America Line, Princess Cruises, BC Hydro and PMV (PMV, 2011a).

Apart from the shore power initiative, the Air Action Program also includes projects that aim to reduce emissions of trucks, cargo handling equipment and trains in the port.

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<sup>26</sup>Only while docked at Canada Place

For example, in 2008 the port introduced requirements regarding truck emissions, which focused on phasing out older trucks<sup>27</sup> and limiting idling. In 2010, the PMV was awarded the EcoFreight<sup>28</sup> Sustainable Transportation Award by Transport Canada for its Air Action Program (Transport Canada, 2010).

The requirements set out in the Air Action Program are in line with the Northwest Ports Clean Air Strategy (NPCAS), which the PMV developed together with the ports of Seattle and Tacoma. This strategy aims to address port-related air quality and climate change issues in the Georgia Basin Puget Sound air shed (PMV, 2011b). The NPCAS was established as a result of public pressure for ports to take similar measures as the ports of Los Angeles and Long Beach (Woudsma et al. 2009). Several areas in Georgia Basin Puget Sound did meet the more stringent U.S. air quality regulations (PoS et al., 2007).

The EcoAction program is another program of the PMV to address its environmental issues. For example, shipping lines are offered lower harbour fees if they reduce their emissions while in port (PMV, 2011c).

Even though the PMV shows its commitment to reducing its environmental impacts and those of the port users, it does not provide (public) information on its EMS.

#### **6.4 Port of Seattle**

In 2010, the Port of Seattle (PoS) was the 7th largest container port in North America and handled 2.1 million TEU (AAPA, 2011). The text that immediately draws attention on the website of the port of Seattle is the slogan “where a sustainable world is heading”. The website provides information on the environmental initiatives on the web pages ‘green gateway’ and ‘port & community’.

As part of its sustainability strategy, the PoS contracted a consultant in 2009 to compare several options for container transport from Shanghai, Hong Kong and Singapore to the U.S. According to the consultant’s report, the PoS is the best U.S. option for cargo from Asia to Chicago, Memphis and Columbus in terms of a low carbon footprint when using rail transport for the inland transportation. The PoS was compared

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<sup>27</sup>The requirements will bring the fleet up to the equivalent of a 2007 truck for particulate matter emissions.

<sup>28</sup> The EcoFreight program is explained in section 7.6.

to the ports of Prince Rupert, Los Angeles, Houston, Savannah, Norfolk and New York New Jersey (Herbert Engineering Corporation, 2009). The report did not compare other ports in the Georgia Basin Puget Sound to the Port of Seattle and, for example, Port Metro Vancouver could make a similar claim as the Port of Seattle is making concerning the carbon footprint of container transport between the selected Asian and ports and U.S. cities.

As part of the Green Gateway claim, the port of Seattle has also launched its Green Gateway Partners Awards in 2010. With this award the environmental efforts of shipping lines that call at the port are acknowledged. Shipping lines receive a letter from the port of Seattle acknowledging their environmental efforts and some shipping lines, for example APL (APL, 2010), mention this award on their websites.

The requirement for a shipping line to be eligible for the award is that it must participate in the 'At-Berth Clean (ABC) Fuels' program. The program and other environmental initiatives are explained on the web page 'port & community'. The ABC Fuels program was launched in 2009 and encourages shipping and cruise lines to burn low-sulfur fuel while at berth. The port reimburses the shipping lines with US\$2,250 per visit, which partly offsets additional fuel costs when they participate in the program. On June 27, 2011, the 800<sup>th</sup> ship using low sulfur fuel while at berth entered the port (PoS, 2011b).

Another environmental initiative of the PoS is the Clean Truck Program (CTP). Since January 1, 2011, all drayage trucks must comply with the CTP Guidelines to enter Port of Seattle's cargo terminals. According to these guidelines all trucks must have model-year 1994 or newer engines and all trucks must be registered in the Port's Drayage Truck Registry and display the Green Gateway sticker (PoS, 2011a). The PoS also provides shore power for cruise ships docked at Smith Cove Terminal. 40% of all cruise ships in the PoS waters use shore power (PoS, 2011a).

The PoS is one of the partners in the Northwest Ports Clean Air Strategy and the CPT and ABC Fuel program are strongly related to this regional clean air strategy. Other partnerships of the port regarding environmental initiatives include the Dalian Eco-Partnership. This is an agreement for the exchange of information and best practices between China and Seattle. According to an article on the website of 'World Port

Development' this partnership is one of the main reasons why Asian companies increasingly ship their goods to the PoS (Feller, 2010). However, no statistical proof was provided in support of this claim.

As acknowledgement for their environmental management efforts, the American Association of Port Authorities (AAPA) presented the PoS with the Comprehensive Environmental Management award (AAPA, 2010).

## **6.5 Port of Virginia**

The Port of Virginia (PoV) handled 1.8 million TEU in 2010, which made it the 8<sup>th</sup> largest North American port in terms of container throughput (AAPA, 2011). The port has developed several environmental initiatives and used the slogan "The Port of Virginia: building a brighter, cleaner, greener future" (PoV, 2011a). This slogan was removed from its website in July 2011 and it currently has "Biggest. Deepest. Newest. Best." on the front page of its web site. This suggests that the former 'green' slogan did not provide sufficient marketing value to the port.

Though the port does not publicly publish its environmental goals, it does express the hope to one day be the greenest port of the country (PoV, 2011a). On its website the port mentions that the EMS for its terminal operations was already ISO 14001 certified in 2008 and it is currently developing an EMS for its other operations.

One of the initiatives the port has developed to reduce its environmental impacts is the Green Operators (GO) Program. The goal of the program is to reduce air pollution of drayage trucks serving the PoV's facilities by providing rebates to retrofit older vehicles with more emission-efficient engines. The program has received funding from the Virginia Department of Environmental Quality and the EPA's National Clean Diesel Program (PoV, 2011b). Other initiatives include the construction of a wetland areas and oyster banks in 2002 and 2003. The port also developed a storm water treatment facility, thereby exceeding legal requirements (PoV, 2011c).

The PoV does not mention on its website that it is member of any partnerships that focus on the environmental performance of ports or transport operations, but the CRT website states that the port is one of its members (CRT, 2011a).

## 6.6 Port of Montreal

The Port of Montreal (PoM) handled 1.3 million containers (TEU) in 2010. In terms of container throughput it ranked number 13 among North American ports (AAPA, 2011).

The PoM has an EMS (PoM, 2008), but it is not mentioned if its EMS is certified by a third party. However, the EMS of the two container terminals of the PoM, the Montreal Gateway Terminals Partnership (MGTP), is ISO 14001 certified (MGTP, 2009).

Apart from the EMS, the PoM includes environmental clauses in the leases of its tenants and has developed a number of environmental programs. The programs include a recycling program and a 10% port fee reduction for ships with a Green Award certification. The port received funding through the Canadian Government's EcoFreight program to acquire a fuel-efficient locomotive (PoM, 2010a) and it is also participates in Green Marine partnership<sup>29</sup> (PoM, 2008)

As part of the Green Marine partnership, the PoM performs an annual self-assessment<sup>30</sup> of its environmental policy and initiatives. In 2010 the PoM achieved the best results of all the 15 Green Marine member ports and port authorities on the St. Lawrence and Great Lakes. The port goes beyond environmental regulatory requirements in terms of its reduction of GHG emissions and management of cargo residue. The self-assessment also indicated that the port shows strong environmental leadership (PoM, 2010b). Besides the Green Marine partnership, the port also participates in the WPCI.

Although the PoM claims to offer the shortest route between major European and Mediterranean ports and North American markets (PoM, n.d.), the port does not link this statement to an environmental claim.

## 6.7 Conclusion

The literature and examples of the ports competing for containers destined for the U.S. Midwest demonstrate that ports are actively taking steps to reduce their environmental impacts. However, their target audience and the degree to which they make their activities public differ. Almost all ports appear to specifically target the local

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<sup>29</sup> The Green Marine partnership is further explained in section 7.7.

<sup>30</sup> Results reported by participating companies are subject to an external verification process every two years (Green Marine, 2011a)

communities to express their commitment to reducing environmental impacts of their operations. Clients are informed about environmental requirements and voluntary programs on the websites, but the environmental initiatives are not developed to improve the competitive position of the ports.

The main drivers for environmental initiatives are clearly the impact on local communities and climate change. This has resulted in strong regulatory measures in the U.S., but also in considerable amounts of funding from the Federal Government to compensate carriers for investments in cleaner transport equipment and operations. The ports themselves have also invested millions of dollars to assist trucking companies and shipping lines in reducing their environmental impacts.

When comparing the environmental practices of ports on the East coast with the ports on the West coast, the examples in this chapter show that the ports on the West coast are taking more rigorous steps to reduce their environmental impacts, or at least provide more information on what actions they are taking. The exception is the PNYNJ, which because of its size and local impact has also developed an elaborate environmental strategy. This shows that in the examples in this chapter the largest ports are leading the development in environmental initiatives, which are followed by the other North American ports.

Almost all ports included as examples in this chapter are members of the WPCI and are often involved in other bilateral or multilateral initiatives. There are also regional initiatives such as the air pollution related strategies on the west coast and the Green Marine initiative on the east coast.

The only port that actively takes a supply chain approach in its marketing efforts is the Port of Seattle. It promotes itself as the ‘Green Gateway’ of Asia to the U.S., but this claim is only based on its geographical location and not support by initiatives.

Though ports focus on reducing local environmental impacts, their efforts often result in greener supply chains. For example by offering trucking companies financial incentives to ‘green’ their operations. This takes place especially in the U.S. and the Port of Vancouver has followed this example by implementing similar initiatives.

## **7 Environmental partnerships**

In the previous chapters a number of partnerships or multilateral initiatives related to environmental performance of maritime transport and ports are mentioned. This chapter presents a short analysis of the main elements of these partnerships and initiatives. They include the CCWG, SmartWay, CRT, SSI, WPCI, CCWG, EcoFreight and Green Marine.

### **7.1 Clean Cargo Work Group**

The Clean Cargo Work Group (CCWG) is a business-to-business collaboration, which aims to integrate environmentally and socially responsible business principles into transportation management. It does so by developing a verification standard for environmental information, providing a platform for a dialogue between cargo owners and carriers on environmental issues and enabling the exchange of best practices. The CCWG is also intended to increase transparency in the shipping industry by facilitating the exchange of information between cargo owners and carriers.

Currently the CCWG has 32 participants, including multinational manufacturers, retailers and freight carriers, which collectively move nearly 60% of global container cargo. Examples of these participants are Maersk, MSC, CMA CGM, Cosco, Hapag-Lloyd, Wal-Mart, DHL and Kuehne & Nagel (BSR, 2011a).

Since its establishment in 2003, CCWG has gathered emissions data (CO<sub>2</sub>, SO<sub>x</sub>, NO<sub>x</sub>) from ocean carriers and has developed a method for assessing ocean carriers' environmental performance. This assessment uses a carrier 'scorecard' to quantify performance and benchmark individual carriers against industry performance. The categories included in this scorecard are:

- CO<sub>2</sub>, SO<sub>x</sub> and NO<sub>x</sub> emissions;
- Waste, water and chemicals management;
- EMS;
- Transparency.

This information on the environmental performance of the carriers is distributed annually to the CCWG members. The information has also been used to determine the

average CO<sub>2</sub> emissions per major trade lane and can be used by cargo owners to determine the CO<sub>2</sub> footprint of their ocean transport requirements (BSR, 2011a)

The CCWG does not have any ports as participants. The initiative's goal of measuring and providing transparency regarding environmental impacts of ocean carriers to cargo owners does not require the participation of ports. However, the CCWG provides a platform that could be used to find methods to reduce the environmental impacts from a supply chain perspective. If this approach were chosen, the initiative would benefit from including ports. Ports would benefit because they would gain more insight in the influence of environmental issues on supply chain decisions and could better focus their environmental initiatives towards supply chains. It would also provide a good opportunity to learn from best practices and to network with some of the leading global companies.

## **7.2 U.S. EPA SmartWay Partnership**

In 2004, the EPA launched SmartWay as a brand that represents products and services that reduce transportation-related emissions (EPA, 2010b). With regard to freight transportation, SmartWay addresses energy efficiency, GHG emissions and air pollution.

By 2012, this initiative aims to reduce between 33 - 66 million metric tons of CO<sub>2</sub> emissions and up to 200,000 tons of NO<sub>x</sub> emissions per year, for example through the reduction of fuel consumption by 150 million barrels of oil annually. The initiative consists of three main components: creating partnerships, reducing all unnecessary engine idling, and increasing the efficiency and use of rail and intermodal operations (EPA, 2011a).

Currently there are over 2,600 partners and all SmartWay truck carriers, rail carriers, and logistics companies have fuel efficiency and environmental performance scores. The SmartWay web site offers a link to an e-clearinghouse where carriers that want to invest in SmartWay approved technologies and financial institutions that are willing to lend money for these investments can meet (EPA, 2010c).

The U.S. Federal Government has made funds available to reduce the air pollution and GHG emissions associated with freight transport through the Diesel Emissions Reduction Program. This program provides the EPA up to US\$200 million per year for



2007 through 2011 for promoting diesel emission reductions. 30% of these funds are allocated to the states (EPA, 2011b). The states have used these funds for their own funding programs. For example the California Air Resources Board and local air pollution control districts provide grants for the entire incremental costs of voluntarily reducing emissions from heavy-duty engines. Another example is the State of Maine that provides a 25% rebate for idle reduction equipment (EPA, 2010d). Often companies are eligible for grants or low-cost loans when they apply SmartWay-approved emission reduction technologies.

The main benefits for companies that become SmartWay partners include grant and low-cost loan opportunities, reduction of fuel costs and improved business-to-business opportunities. The business-to-business opportunities arise from the fact that cargo owners that become SmartWay partners commit to shipping at least 50% of their goods using SmartWay carriers. Companies as Wal-Mart, Target, Home Depot and Lowe's are all SmartWay partners and this provides an incentive for carriers to join as well. All carriers and cargo owners that want to become SmartWay partners have to assess their environmental performance and agree to set and strive for attainment of environmental and fuel efficiency goals within three years. EPA offers assistance to perform the assessments and to set the goals (EPA, 2010e).

The initiative has grown strongly since it started in 2004. In 2005, SmartWay had 200 partners and in 2010 this number increased to 2600 partners (EPA, 2010c), including Canadian companies that are also allowed to join the initiative (EPA, 2010f).

In 2011, the EPA launched the SmartWay Drayage Program with the CRT and the Environmental Defense Fund. Drayage carrier partners sign a partnership agreement and commit to track emissions, replace older and more pollutive trucks with newer, cleaner ones and achieve at least a 50% reduction in PM and 25% reduction in NO<sub>x</sub>, below the industry average, within three years. SmartWay cargo owners commit to ship 75% of their port cargo with SmartWay drayage carriers within the same time period (EPA, 2011c). Required investments can be funded with help of a variety of EPA, state, regional and local programs (PR Newswire, 2011).

There are no ports that are SmartWay partners and the benefits of joining would be limited for the ports, because they are not cargo owners themselves or own commercial

fleets of trucks or locomotives. However, ports do benefit from cargo owners and carriers that join the SmartWay program. It could improve the environmental performance of the port, if less polluting trucks offer services to and from the port. This would improve the image of a port and create 'greener' transport options for cargo owners.

### **7.3 Coalition for Responsible Transportation**

The CRT was established in 2007 and includes importers, exporters, trucking companies, truck manufacturers and ocean carriers. Members include Wal-Mart, Home Depot, Target, Lowe's, CMA CGM and Expeditors and in 2011 the Georgia Port Authority, the South Carolina State Ports Authority, and the Virginia Port Authority have also joined CRT (CRT, 2011a).

The goal of the CRT is to identify and implement best practices to reduce port-related diesel emissions and protect the environmental quality of port communities in the U.S. To achieve this, the CRT developed the Clean Truck Initiative in which members of CRT work together with U.S. ports to establish and implement industry-supported clean truck programs. The aim is that these programs are both environmentally and economically sustainable. CRT has established a national program and rating system for emissions of port trucks to facilitate the development of clean truck programs (CRT, 2011b).

U.S. ports that intend to develop a clean air strategy could benefit from joining or cooperating with CRT. They can utilize the experience of the CRT and cooperate with major importers and carriers.

### **7.4 Sustainable Shipping Initiative**

The SSI was founded in 2010 by the Forum for the Future in collaboration with WWF, Maersk Line, BP Shipping, Lloyd's Register, Gearbulk, and ABN Amro (Maritime Journal, 2010).

The goal of the SSI is to support the shipping industry to make long-term plans for future success (SSI, 2011a). The members of SSI will develop a vision on how the shipping industry can be socially and environmentally responsible and profitable in 2040. This vision will be translated into an action plan and the members will engage the rest of the industry. Implementation of the action plan is expected to start in 2013 (SSI, 2011b).

The initiative started with seven members and by July 2011 this number had increased to 17 members. These members include NGOs, shipping lines, financial institutions, shipbuilders, cargo owners and classification societies (SSI, 2011a).

Currently there are no ports that have joined the initiative. The participation of a port or terminal organization would be beneficial for both the initiative and the joining port. Ports are also exploring ways to become more sustainable and their actions have impacts on the shipping industry. A joint vision and action plan that includes buy-in from the ports would enhance the chances of success for this initiative.

### **7.5 World Ports Climate Initiative**

In 2008, the International Association of Ports and Harbors (IAPH) requested its Port Environment Committee, to develop a mechanism to assist ports in their efforts to combat climate change (WPCI, n.d.)

In that same year 55 ports from all continents came together in Rotterdam to adopt the World Ports Climate Declaration and the WPCI was formally launched at the Port of Los Angeles in 2008 (WPCI, n.d.). The goals of the WPCI are: to deepen the support for WPCI among the world's ports; promote information sharing; establish a framework for CO<sub>2</sub> footprint inventory and management; establish Environmental Ship Indexing and increase support for this measurement; organize global support for WPCI goals among regional and global organizations (WPCI, n.d.).

The WPCI has initiated several projects in collaboration with hosting ports. Current projects include the development of a model that port authorities can use to develop their own intermodal strategy, the development of a lease agreement template that includes environmental requirements for tenants and two test cases of cargo handling equipment that use cleaner fuel technologies. This year a new project will be started that aims to develop guidelines and assess the possible impact for ports regarding their infrastructure, safety requirements for bunkering and the legal aspects of liquefied natural gas (LNG) as an alternative fuel to conventional fuels for ships (WPCI, 2011).

The WPCI has also developed a guidance document for ports looking to develop or improve their GHG emissions inventories and in 2010 the WPCI launched a website that provides information on shore power (WPCI, 2010a).

The Environmental Ship Index (ESI) developed by WCPI is a method to assess the extent of air emission reduction of ships and determine if they perform better than required by the current emission standards of the IMO. The index is intended for use by port authorities to reward ships that participate in the ESI and perform well. This will promote the use of ships that cause less air pollution and in turn, can be used by cargo owners and ship owners as a marketing tool (WPCI, 2010b).

The website of WPCI makes no mention of member meetings or meetings regarding the project. It is unclear how and what information is shared between the participants, and as this is not made public, the added value for a port authority to join this initiative is not determined in this report.

## **7.6 EcoFreight**

The Canadian EcoFreight program was launched in 2007. It is a CA\$61 million program of the Canadian Federal Government, aimed at reducing the environmental and health effects of freight transportation in Canada. The program consists of seven different initiatives:

- National Harmonization Initiative for the Trucking Industry: Investments up to CA\$6 million to help remove regulatory barriers to the adoption of emissions-reducing technologies for the trucking industry;
- Freight Technology Demonstration Fund (FTDF): Investments up to CA\$10 million for the demonstration of new technologies;
- Freight Technology Incentives Program (FTIP): Investments up to CA\$10 million in incentives for freight companies to purchase and install technologies that have a proven ability to reduce emissions;
- Marine Shore Power Program: Investments up to CA\$6 million to reduce emissions of ships when idling in port through the use of shore power;
- EcoFreight Partnerships: Investments of up to CA\$7 million to build public partnerships, public-private partnerships and industry partnerships on freight transportation.
- EcoEnergy for Fleets: Investments up to CA\$22 million to encourage commercial and institutional trucking fleets to take advantage of existing and emerging

technologies with a focus on driver education and energy management, and best practices (Cannon, 2007).

In May 2010, 40 projects were underway that together received CA\$10.6 million under the FTDF and FTIP (Government of Canada, 2010). Unfortunately the EcoFreight website only provides information on the first round of funding and only on the first 23 projects. The second round resulted in only one additional project. The Port of Montreal received funding for the purchase of a relatively fuel-efficient locomotive (PoM, 2010a).

Only one project is mentioned on the EcoFreight website under the Marine Shore Power program and this project at the Port Metro Vancouver received CA\$2 million and the last round of application for funding ended in 2009 (EcoFreight, 2010). The EcoFreight website makes no mention of new funding rounds before the end of the program in 2012 (Government of Canada, 2010).

Although one of the goals of EcoFreight was to establish partnerships, no information has been provided on how successful this goal has been. It can therefore not be verified if the project is as successful as the SmartWay program in terms of partnerships. In sum, it is not clear what the funded projects entail and what the achievements are in terms of the reduction of environmental impact.

For Canadian ports, the EcoFreight program could be interesting if it still provides funding for initiatives.

In June 2011, the Canadian government announced that it will make CA\$48 million available over two years “to develop transportation sector regulations and next-generation clean transportation initiatives” (Government of Canada, 2011). This could provide opportunities for Canadian ports to setup partnerships and develop ‘green’ initiatives.

## **7.7 Green Marine**

The Green Marine initiative aims to improve the environmental performance of the shipping industry. It was established in 2008 for companies and organizations that use the Great Lakes and St. Lawrence corridor, but also triggered the interest of maritime companies operating outside this region. It is now a Canadian-U.S. voluntary program that has participants both on the east and west coasts of North America. The program

requires participating companies to assess and take concrete action to continuously improve their environmental performance (Green Marine, 2011b).

Green Marine has developed a self-evaluation guide to help participants assess their environmental performance with respect to the program's criteria. The criteria relate to aquatic invasive species, SO<sub>x</sub> and NO<sub>x</sub> emissions, GHG emissions, cargo residues, conflicts of use for ports and terminals and environmental leadership. The results of the self-evaluation are subject to an external audit every two years and the results of the participants are published annually (Green Marine, 2011a).

In total, the initiative has 56 participants, consisting of ports, terminals, stevedoring companies and shipping lines. The Montreal Port Authority, Quebec Port Authority, Prince Rupert Port Authority and Saint John Port Authority are some examples of participating ports in the Green Marine initiative (Green Marine, 2011c).

Organizations that do not operate ships, ports, terminals or shipyards, but that have business links with the marine industry can also join the initiative as partners and promote participation in Green Marine (Green Marine, 2011d). Organizations that have an interest in the maritime industry, but no business link, can join the initiative as supporters. They support the program either symbolically or through the provision of services. In July 2011 the program had over 120 members, which includes participants, partners and supporters (Green Marine, 2011e).

For ports there is added value in joining an initiative like the Green Marine Program. It offers the opportunity to benchmark the port's environmental performance, to learn from best practices, to learn what initiatives are taken in other parts of the supply chain, to network and to use the program as a marketing tool. However, the added value for a port will depend on the quality of the participants, especially their environmental performance.

## **7.8 Conclusion**

The examples included in this chapter show the wide variety of environmental voluntary partnerships and initiatives that exists.

Table 6 provides a summary of the partnerships and initiatives described in this chapter.

Table 6: Overview of examples of environmental partnerships in transport sector

| <b>Initiative</b>                              | <b>Goal</b>  | <b>Members</b>   | <b>Added value for ports</b>  |
|--|--|--|---|
| World Ports Climate Initiative (WPCI)          | To develop a mechanism to assist ports in their efforts to combat climate change   | 55 ports from all over the world   | <ul style="list-style-type: none"> <li>- Cooperate with other ports on projects;</li> <li>- Improve image of the port;</li> <li>- However, added value of joining could be limited for ports as findings and tools are also publicly available.</li> </ul>  |
| Sustainable Shipping Initiative (SSI)          | To assist the shipping industry to make long-term plans for future success   | Global initiative with 17 maritime companies and interest groups (no ports)                                  | <ul style="list-style-type: none"> <li>- Learn from vision of other parties in the shipping industry;</li> <li>- Cooperate with industry and NGOs;</li> <li>- Prepare for future developments.</li> </ul>   |
| Clean Cargo Work Group (CCWG)                  | To integrate environmentally and socially responsible business principles into transportation management   | Global initiative with 32 members including cargo owners, ocean carriers and 3PLs                            | <ul style="list-style-type: none"> <li>- Gain insight in the influence of environmental issues on supply chain decisions;</li> <li>- Learn from best practices;</li> <li>- Expand network with some of the leading global companies.</li> </ul>   |
| Coalition for Responsible Transportation (CRT) | To identify and implement best practices to reduce port-related diesel emissions and protect the environmental quality of port communities in the U.S. | (Large) based cargo owners, carriers, manufacturers and ports in the U.S.                                    | <ul style="list-style-type: none"> <li>- Make use of CRT experience in assisting the development of clean air strategies</li> <li>- Cooperate with major cargo owners and carriers</li> <li>- However, limited to U.S. ports</li> </ul>   |
| Green Marine                                   | Improve environmental performance of its members by undertaking concrete and measurable actions.   | 120 Canadian and U.S. based maritime companies and organizations (including ports)                           | <ul style="list-style-type: none"> <li>- Benchmark port's environmental performance</li> <li>- Learn from best practices in other ports and parts of the supply chain</li> <li>- Improve network of (potential) clients</li> <li>- Use as marketing tool</li> <li>- However, the added value depends on the quality of the participants.</li> </ul> |
| SmartWay                                       | To reduce CO <sub>2</sub> and NO <sub>x</sub> emissions and fuel usage of trucks and trains in the U.S.  | 2600 Cargo owners, 3PLs, rail companies in the U.S. and trucking companies in the U.S. and Canada (no ports) | <p>Ports could promote participation of logistic service providers to, from and in the port to:</p> <ul style="list-style-type: none"> <li>- Improve the environmental performance of the port,</li> <li>- Improve the image of a port</li> <li>- Create 'greener' transport options for cargo owners.</li> </ul>                                   |
| EcoFreight                                     | To reduce the environmental and health effects of freight transportation in Canada   | The program was meant to create partnerships, but no information is provided on the success.                 | <ul style="list-style-type: none"> <li>- Program appears to provide little added value for ports</li> <li>- New funds made available by Canadian government to fund 'greening' of transport and Canadian ports could use develop initiatives with these funds</li> </ul>  |

SmartWay in the U.S. has been especially successful in attracting members, because it combines regulatory and market pressures with financial incentives. Market pressure stems from the participation of many large cargo owners in the program that have committed to using SmartWay carriers. For ports it is beneficial to promote such an initiative, because it can reduce the environmental impact of the operations in the port and create 'green' transportation options to and from the port. Unfortunately, Canada has not yet developed a good equivalent for this U.S. program, but Canadian companies are able to become SmartWay partners. However, they are not eligible for funding opportunities provided by the U.S. Federal and State governments. Perhaps the CA\$48 million that the Government of Canada recently made available to reduce the environmental impacts of freight transportation could change this situation.

Another initiative that has grown strongly, but on a much smaller scale than SmartWay, is the Green Marine initiative in the U.S. and Canada. This industry wide initiative includes ports, shipping lines and stevedoring companies and offers an opportunity to compare the environmental performance of the members, learn from best practices and to attract commercial opportunities. Much of the added value depends on the quality of the participants. Ports could approach organizations and companies with which they would like to cooperate and jointly become a member of the initiative. In doing so the port would make sure that the initiative is of added value to the port.

The CCWG and SSI could benefit from the participation of a large port or terminal operator, to ensure that solutions and actions developed to reduce the environmental impact of the shipping industry are aligned with actions developed by ports. This is especially relevant given the fact that most initiatives developed to reduce the environmental impacts of shipping in port areas have been initiated by ports. For a port these initiatives would provide a good opportunity to build up or improve commercial relations with large cargo owners and ocean carriers. It would also enable the port to better anticipate future developments with regard to environmental issues.

All of the aforementioned initiatives state that they aim to assist the transport industry in reducing its environmental impact and strive to develop practical tools to do so. Many of these tools offer the opportunity for transport companies to determine their



environmental performance. This poses the threat that a lack of standardization causes confusion and reduces credibility of the initiatives. If a port wants to assess the environmental performance of the port, it will require information from its customers on, for example, air pollution. If clients use different approaches for the assessment of air quality, this may complicate the efforts of the port. Ports can therefore best request its customers to apply a common approach or assess the compatibility of the different approaches used.

## **8 Conclusions and Recommendations**

The first part of this chapter provides the main conclusions that can be drawn from the analysis of the academic literature and the examples included in this report. Based on these conclusions, the second part provides recommendations for ports on how to address the issue of port competitiveness and environmental issues. It ends with recommendations for further research.

### **8.1 Conclusions from the secondary research**

The academic literature reviewed for this report shows that the key players that make port selection decisions are the cargo owner, shipping line and 3PL. The most important port selection criterion for these players is the ‘fit’ of the port with the total supply chain of the shipment. The best ‘fit’ in relation to port selection means choosing the port that optimizes the decision-makers preferred balance of costs, risks and quality.

There is no evidence in the academic literature that environmental performance of a port plays a direct role in key players’ port selection decisions. However, this does not indicate that transport-related environmental issues in ports are not of concern to the key players in port selection decisions.

The analysis of industry reports and company communication materials of some of the top five container importers into the U.S., global container shipping lines and 3PLs show that many companies are active in addressing environmental issues in and surrounding ports. These measures include voluntary participation in clean marine fuel programs in ports, voluntary participation in programs that stimulate the use of less pollutive drayage trucks, and participation in partnerships to develop joint clean air programs in ports. These initiatives are often part of a wider environmental strategy of cargo owners, shipping lines and 3PLs. Most of the examined companies have developed these environmental strategies and initiatives to adequately address regulations or the threat of more stringent regulations, to potentially reduce costs and to fulfill their need to do “the right thing”. The environmental initiatives focus on issues such as waste and

water use, sourcing of sustainable products and energy consumption, but when considering transport, the focus is on GHG emissions.

The focus of many companies on GHG emissions and reduction thereof has led some carriers and 3PLs to consider their environmental performance as a potential competitive differentiator. They address their own environmental impacts and, especially 3PLs, have developed ‘green’ freight transport services for their clients. The main focus of these services is to assess and reduce, or offset GHG emissions.

From the public information on the ports that serve the U.S. Midwest, included as examples in this report, nearly none of them consider their environmental performance to be a competitive differentiator. They focus their efforts mainly on the environmental impacts on local communities. Thus, the main driver for developing environmental initiatives is the pressure from local communities, assisted by increasingly stringent regulations. This community concern has been accompanied by considerable funds for companies and ports to address their environmental impacts. Especially in the U.S., several hundred million dollars has been made available in the last five years to compensate carriers for investments in cleaner transport equipment and operations.

In recent years, the increased attention from both private companies and the ports regarding the environmental impacts of transport has sparked the establishment of many partnerships. Most of these partnerships or initiatives aim to develop practical tools to assist the transport sector with reducing its environmental impacts but also increasing its transparency on environmental performance. Many of the initiatives enable the participants to benchmark their performance and learn from best practices. Partnerships can be useful for ports if they offer the opportunity to learn from other ports and other types of companies, anticipate future developments in the supply chains and improve relations with potential customers.

Figure 4 provides an overview of the findings concerning environmental issues covered by the examples of retailers, 3PLs, shipping lines, ports and environmental partnerships included in this report. These environmental issues are grouped into four issues: GHG emissions, air quality, water quality and other issues such as noise, dust and dredging impacts. The figure shows that retailers and 3PLs focus their environmental

initiatives with regard to transport on GHG emissions. Shipping lines and ports also address water quality impacts, which includes the issue of invasive species.

Retailers, 3PLs, shipping lines and ports are members of or cooperate with environmental partnerships such as CRT and SmartWay. This is indicated in figure 4 by the width of the arrows. The figure shows arrows for CRT and SmartWay only in relation to GHG emissions and air pollution, because these are the main issues addressed by these partnerships. The CCWG and Green Marine address GHG emissions, air pollution and water pollution and therefore these initiatives have three arrows in figure 4. Retailers, 3PLs and shipping lines are members of CCWG while Green Marine includes shipping lines and ports. The dotted arrow of SSI in figure 4 indicates that it is uncertain what issues this partnership addresses, because it has only developed a broad vision document.

Figure 4 Main environmental issues addressed by companies, ports and partnerships

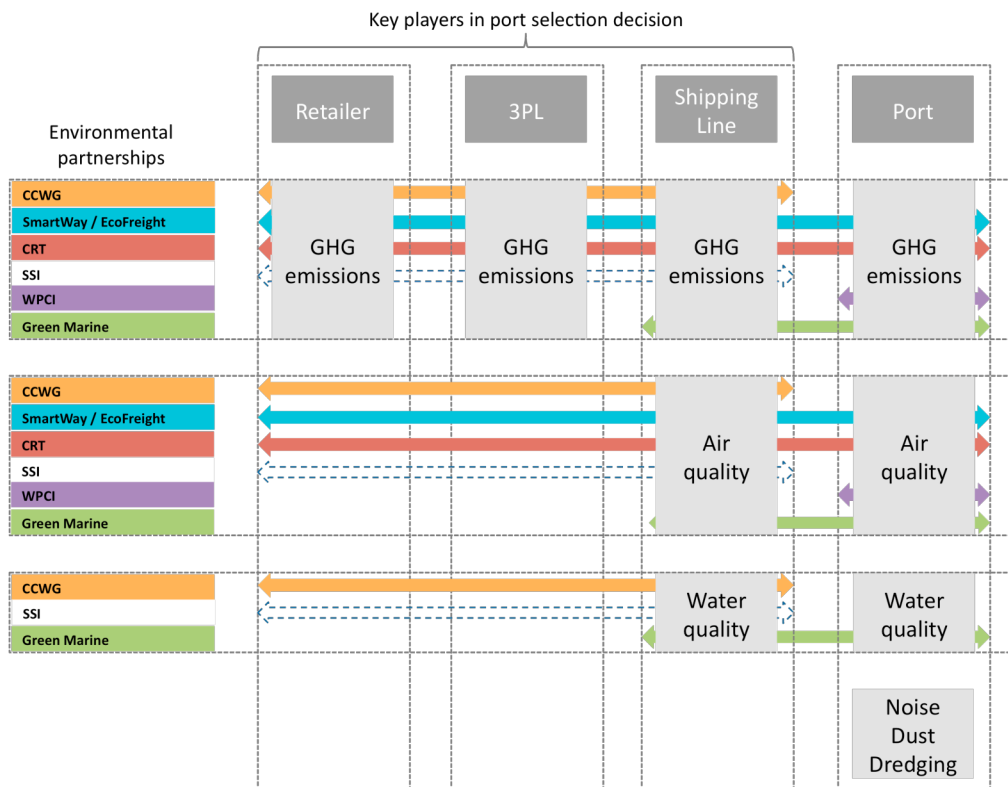


Figure 4 shows the strong focus of key players in port selection, ports and partnerships on GHG emissions. There is no doubt that environmental issues, especially GHG emissions, will become more and more important in the transport sector.

Selecting a certain port could influence the GHG emissions associated with the supply chains of the key port selection players. Though the emissions resulting from the cargo handling activities are relatively small, the distance that the container travels to and from the port and the available modes of transportation can have a relatively large influence on the overall GHG emissions of the supply chain. The emissions of the maritime transport as part of the supply chain depend, amongst others, on the load factor and the size of the ships deployed. Shipping lines mainly offer service routes that make calls at several ports. Determining the influence of each port on load factors and the size of the ship, which a shipping line can deploy on a certain route, is very complex. There is no standardized method to calculate the GHG emissions associated with the transport of single containers from one port to another. This is the reason why some of the key players currently use the average emissions of major trade-lanes to estimate the GHG emissions of their use of ocean transport. Ports that are located on the same major trade-lane will consequently be considered as equals in terms of GHG emissions associated with shipping to these ports. However, they could distinguish themselves in terms of the GHG emissions associated with the transport between the ports and their hinterlands. Providing ‘green’ hinterland connections for the parts of the supply chains controlled by retailers, 3PLs and shipping lines could become a port selection criterion in the coming decade.

Figure 4 also shows that the market will most likely not provide sufficient incentives for ports to address their environmental impacts. Water quality and other issues, such as noise, dust pollution and dredging impacts, are unlikely to become a port selection criterion.

## **8.2 Recommendations**

### **8.2.1 For North American container ports**

Ports depend on logistic service providers that offer services to, from and in the port when they wish to attract more retail containers by means of developing environmental initiatives. Therefore, ports are recommended to cooperate with these parties to address environmental issues and to ensure compliance with requirements of major retailers and 3PLs. Since the decision making power can differ per supply chain, it is important for

ports to know what container-flow intended for retailers passes through their ports and to engage involved parties to find specific solutions.

Ports can also join partnerships that aim to reduce the environmental impact of transportation throughout the supply chain, because this offers the opportunity to benchmark their environmental performance and to learn from best practices of other ports and other types of organizations. It also provides business development opportunities, but the added value depends on the quality of the other participants and possibilities for the exchange of knowledge. Ports are recommended to assess the costs and benefits of such partnerships before they make a decision to join.

Both in the U.S. and Canada funds are made available to address the environmental issues related to transportation. Ports are recommended to engage with local parties to develop joint action plans and apply for government funding.

Last, but certainly not least, ports are recommended to make sure that their efforts are part of an environmental or sustainability strategy. They are recommended to develop a long-term vision, set goals to address environmental issues and develop implementation plans to reach these goals. This will ensure a clear direction of efforts to reduce environmental impacts, make progress measurable, provide clarity to customers and employees and empower them to make decisions in line with ports' strategy.

### **8.2.2 For further research**

The analysis in this report shows that many companies, partnerships, NGOs and governments are actively developing tools to measure the environmental impacts of transport. However, it is not clear if these tools apply similar methods. If different methods are used, this will lead to more confusion about the environmental impacts of transport. Especially for a global industry such as the container shipping industry, different approaches to measuring, for example, CO<sub>2</sub> emissions could lead to a higher administrative burden and it would become impossible to determine the overall effects of reduction measures. Therefore, it is recommended that the compatibility of the applied methods is studied and possibly altered, depending on the amount of deviation.

Another finding is that most of the academic literature on port selection is based on the stated preference of cargo owners, shipping lines and 3PLs. In most cases companies

were presented with a list of criteria and the respondents had to rank the criteria. The reviewed academic literature does not provide any information about how port selection decisions are actually made. For example it does not qualify nor quantify the influence of use of computer(models), the use of decision trees, the influence of risk management or efforts to limit the power of certain ports by shipping part of the cargo through other ports. Further research about the port selection process could be valuable to ports in order to better understand their customers' decision-making processes and the role of environmental issues within these processes.

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