

# Green port marketing for sustainable growth and development

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## ABSTRACT

There are increasing concerns on the environmental impact of port operations and development due to pressing global issues such as climate change and energy conservation. From the sustainability perspective, a port should manage and balance three bottom lines, namely economic prosperity, social wellbeing, and environmental quality. A major driver for sustainability is to attract and retain customers who value sustainability. As such, formulating a green port marketing plan fulfilling the economic, social, and environmental objectives will guide a port towards sustainable growth and development. The study aims to investigate the green marketing status of the world's major ports. With reference to green marketing theories, these ports' green marketing status is reflected by their strategies, structures, and functions. Cross case analysis is performed to identify patterns and trends across the various ports for benchmarking and thereby derive green marketing orientation. The cross case analysis also adds value by representing an international perspective from the major ports in key geographical regions. The results show that more than half of the 30 cases are actively engaged in green marketing. However, ports focus more on strategies, and less on structures and functions. It is recommended that ports should connect the three essential aspects in green marketing efforts.

## 1. Introduction

With the development of environmental legislation accompanied with rising public awareness of environmental issues like global warming and resource depletion, ports are jumping on the bandwagon of sustainable development (Woo et al., 2018). The significance of the maritime transport industry in going green is impactful to the environment as it handles more than 85% of the global trade volume (UNCTAD, 2018). More importantly, the main contributor of pollution comes from shipping traffic within a port and port operations (Tichavaska et al., 2017). Therefore, there is a paradigm shift of the key players of sustainability in maritime transport from shipping companies to port authorities and operators (WG150, 2013). This is especially the case for ports located near cities or local communities, because pollutants from ports, especially NO<sub>x</sub> and SO<sub>x</sub>, have adverse health effects on the living community near the ports (Saxe and Larsen, 2004). A green port proactively integrates climate change adaptation and mitigation measures into its operations and plans (WG150, 2013). From the sustainability perspective, a port should manage and balance three bottom lines, namely economic prosperity, social wellbeing, and environmental quality (Lam and Yap, 2019). A major driver for sustainability is to attract and retain customers who value sustainability (Chan et al.,

2012). As such, proactive corporate orientation and tangible commitment in delivering environmental performance can be a business opportunity for growth. Through green marketing, ports can aim to achieve being branded as a green port. Besides good reputation, these green ports can also achieve sustainable development, social responsibility and economic benefits in the long-run.

Green marketing is defined as the application of marketing tools to facilitate trade that satisfies both organisational and individual goals while reserving, protecting and conserving the physical environment (Mintu and Lozada, 1993). Grounded on green marketing theories, the marketing tools under investigation in our study are the sustainable initiatives applied across a port's strategies, structures, and functions (Karna et al., 2003). Components of these initiatives include environmentally-friendly service information, green advertising, resource and energy conservation argument in marketing, green initiatives and eco-services, and update of company website on environmental issues (Yang et al., 2013). Even though research has shown a positive relationship between green performance and competitiveness of shipping firms (Lai et al., 2013; Yang et al., 2013), there is a gap in the area of green marketing in ports.

This research aims to analyse the world's major ports with regards to their efforts in green marketing. The overall port and respective port

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authority or administration are targeted for the analysis instead of the terminal operator because the port authority and the associated government departments are the overall port planner, developer, and promoter. At the port authority level, both terminal operations (e.g. cargo handling and storage) and marine operations (e.g. ship traffic) are accounted for. Port authorities have the instruments to implement and enforce environmental programs and initiatives in a port, thereby transforming it into a green port (WG150, 2013). Cross case analysis will be employed to systematically investigate the main aspects of green marketing in each port. The analysis will identify patterns and trends across the various ports. This facilitates the comparison of commonalities and differences among different cases. Through cross case analysis, we can deduce whether the major ports in the world match up in terms of their efforts placed on green marketing.

After the introduction, a literature review and theoretical background will be presented in section 2. Section 3 explains the methodology of cross case analysis. Section 4 discusses the research findings and provides recommendations. Lastly, the paper concludes with the major implications and future research suggestions.

## 2. Literature review and theoretical background

In this section, relevant literature on sustainable development, green marketing, and green ports will be reviewed for introducing the theoretical background.

### 2.1. Sustainable development

Sustainable development can be defined as the triple bottom line (TBL) of economic, environmental and social factors. It is the combination of economic prosperity, environmental quality and social justice (Elkington, 1997). The TBL redefines corporate performance from the shareholder's economic perspective to that of the stakeholders with the addition of social and environmental aspects (WG150, 2013). In the context of green supply chain management, its adoption may not directly lead to a firm's competitive advantage (Hazen et al., 2011). It is insufficient for a firm to mainly achieve environmental performance. The importance of sustainable development has been recognized by both practitioners and academics over the years. The holistic view of sustainable development is regarded as strategic because it affects the core business of an organisation and its growth, profitability and even survival (Corbett and Klassen, 2006; Chan et al., 2012). Through sustainable development, firms can ultimately achieve long-term competitiveness (Carter and Rogers, 2008). Ports are also moving into the development of sustainable solutions in planning and operations. In the works of Peris et al. (2005) and Sakar and Cetin (2012), a set of indicators in terms of economic, social and environmental development in a sustainable port are provided. Acciaro (2015) reviews the corporate responsibility strategies of 10 major ports in the world and develops research propositions.

Elkington (1997) argues that the key to sustainability is through stakeholder engagement. This is in line with the conceptual framework established by Sakar and Cetin (2012) with stakeholders as a crucial part in developing a sustainable port. Customers are a major group of stakeholders that should be targeted at. Customer participation plays an important role for firms to understand customers' requirements and expectation in social and environmental concerns (Kim and Lee, 2012). A major source of revenue comes from customers so integrating their social and environmental concerns into a firm's plan and actions is also beneficial for the economic aspect (Lam and Dai, 2015). To develop the concept of stakeholder engagement for sustainable development, we have chosen green marketing as the focus of this study.

### 2.2. Green marketing

Green marketing is defined as the holistic management process

responsible for identifying, anticipating and satisfying the requirements of customers and society, in a profitable and sustainable way (Peattie, 1995). Green marketing is part of a corporate strategy to meet customer, stakeholder, organisational and legal requirements. It has become more popular because of increasing importance in environmental sustainability (Dangelico and Vocalelli, 2017). The theoretical framework for green marketing in our study is adopted from Karna et al. (2003). The framework incorporates sustainability into three hierarchical levels of green market planning being marketing strategies, structures, and functions. Strategies refer to using environmental strengths as a competitive advantage. Implementation of the strategies depends on marketing structures and functions. Structures refer to management systems and organisation, whilst functions are mainly communication and advertising. By incorporating sustainability into its strategies, structures and functions, a port can employ green marketing to promote itself as a green port. It is beneficial to be identified as a green port especially in face of increasing pressure from the government, general public and environmentalists (Lam and Notteboom, 2014). However, previous studies focused on sustainable performance through green policies, stakeholder management, pollution prevention, and port technology (e.g. Bailey and Solomon, 2004; Osthorpe and Manz, 2012; Xiao and Lam, 2017). There is a lack of discussion relating green marketing and the associated performance of a port in the literature.

Apart from the traditional marketing goals of customer and organisational satisfaction, green marketing brings about an addition of ecosystem compatibility. Furthermore, there is a transition of concepts towards concern for the environment in the decision making, philosophy, ecological responsibility and general tools of organisations (Sharma et al., 2010). Green marketers can be identified as proactive or reactive, depending on the extent of consideration placed on environmental issues in their market planning. Both types of marketers seek competitive advantage through sustainability but the proactive green marketers believe in the free market system while the reactive green marketers await government intervention (Karna et al., 2003). However, sustainable development can only be achieved with proactive corporate marketing and proactive government intervention (Sheth and Parvatiyar, 1995). Moreover, marketing orientation of green marketers can be derived. Some firms take a strategic approach with efforts in innovation, while others use a tactical/shorter-term approach focusing on mitigating negative environmental impacts. In the case of ports, proactive government intervention would come through port authorities or relevant government agencies (Lee and Lam, 2017). Good governmental regulation supports innovation while bad regulation damages competitiveness (Porter and van der Linde, 1995).

With the uprising trend of green marketing (Chamarro et al., 2009), reports of corporate greenwashing spiked especially since the global event 'Earth Day' in 1990 (Deen, 2002). Greenwashing is "the act of misleading consumers regarding the environmental practices of a company or the environmental benefits of a product or service" (Greenpeace, 2014). In this context, it is the misuse of green marketing and the lack of connection between the marketing strategies, structures and functions (Karna et al., 2003). This point reinforces the need for a theoretical framework for green marketing to guide the research to identify those ports which are genuine green marketers.

### 2.3. Green port

A sustainable port should be both economically and environmentally efficient (Chang, 2013). An increasingly important component of port competitiveness is environmentally friendly reputation of port operations (Hales et al., 2016). There are considerable costs for protecting the environment while conducting business operations, such as investment in green technologies (Woo et al., 2018). A main concern of the public is that these environmental protection costs would be pushed from the industries to the local community over time,

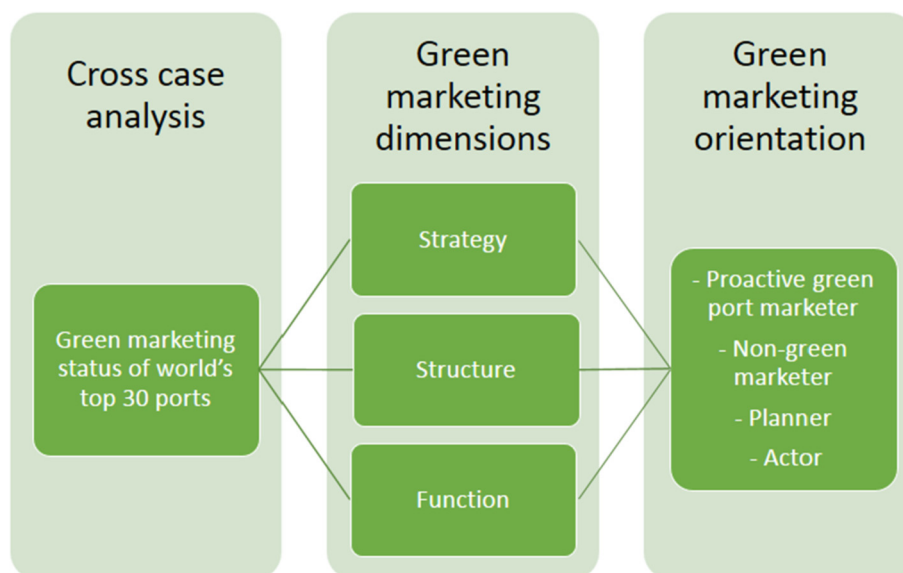


Fig. 1. Theoretical framework of green port marketing research.  
Source: Authors.

that is, the investment costs of environmental protection may be added to the local community. Therefore, it is recommended that stakeholder engagement and coordinated maritime policies be used to address this concern (Bateman, 1996). In addition to Bateman's claims, the ports of UK employed scientific monitoring to address the environmental issues in ports. It is through solid scientific monitoring and evidence gathered that enforced the environmental protection plans and policies into achieving their environmental targets (Wooldridge et al., 1999).

As mentioned above, the three main methods in becoming a green port are through stakeholder engagement, green policies, and scientific monitoring. Firstly, there are four groups of stakeholders in a port community, namely internal stakeholders, external stakeholders, legislation and public policy stakeholders, and community stakeholders. Meeting the objectives of the latter three groups of stakeholders is crucial in achieving long term port sustainable development (Sakar and Cetin, 2012). The study by Lu et al. (2016) finds that external sustainable collaboration contributes to internal sustainable management of ports, and is thereby positively related to sustainability performance.

Secondly, green port policies that establish zones of reduced ship speed, alternative maritime power technology and emission control areas particularly reduce exhaust emission in ports along with other benefits like lower fuel consumption (Chang and Wang, 2012). Such green policies would significantly improve the air quality of the region because air pollution is one of the major environmental impacts of port operations (Zhu et al., 2017). The reduction of air pollution would then reduce the adverse health effects on the local community which include respiratory diseases like asthma, cardiovascular disease, lung cancer and premature mortality (Bailey and Solomon, 2004). Green port policies also contribute to lowering greenhouse gas emission. Using Taipei Port as an example, by implementing the activity-based method, there are considerable reductions in CO<sub>2</sub> emissions when transshipment routes were changed from major ports in Taiwan to Taipei (Liao et al., 2010). Water pollution, another major environmental impact, mainly comes from daily shipping operations. The empirical analysis of the Port of Rotterdam concludes that the sources of water pollution in the port include ballast water, fuel oil residue and waste disposal (Ng and Song, 2010). Water contamination and adverse impacts on the marine ecosystem due to alteration of the sea floor also results from dredging and terminal construction (Peris et al., 2005). As such, green port policies should direct efforts to tackle these environmental issues. An analytical framework involving pricing, monitoring and measuring, market access

control and environmental standard regulation that port authorities can use provides guidelines and tools for green port management (Lam and Notteboom, 2014).

Thirdly, for scientific monitoring, the three main methods include water quality analysis, sediment analysis, and ecological monitoring. These methods are used to measure the impact of port operations, mainly focused on top environmental issues regarding water quality, dredging, port development, dust, and noise (Wooldridge et al., 1999). The six main environmental parameters to be monitored include marine related issues, water quality, meteorological parameters, turbidity, and sediment processes (Darbra et al., 2009). Monitoring and estimating carbon footprint represents another environmental aspect of green ports (Mamatok and Jin, 2017). Green port development evaluation can also be conducted by employing the Drivers, Pressures, States, Impacts and Responses (DPSIR) framework (Wan et al., 2018) or other multi-dimensional performance indicators (Chen and Pak, 2017).

After the literature review, there is a better understanding of what makes up a green port and the connection with sustainable development. This provides a theoretic foundation when we attempt to link sustainable initiatives into the green market planning of ports. Prior green or sustainable port studies concentrate on environmental impacts, policy, performance measurement, actors, stakeholders, and strategies. However, past literature did not cover any green marketing strategies for ports. There were general green marketing tools mentioned but none was applied in the maritime industry and in this context, the port sector. Therefore, our research adds value to the literature and industry by translating the general green marketing tools into the context of ports.

#### 2.4. Theoretical framework

Based on the above discussion, a theoretical framework is formed, as shown in Fig. 1. The cross case analysis is founded on three green marketing dimensions in the literature, which are strategy, structure, and function. By analyzing the three dimensions of green marketing, one can derive the ports' green marketing orientation. When a port is not involved in any of the three green marketing dimensions, the port is a non-green marketer. On the other hand, when a port is committed in all three aspects, this case should be a proactive green marketer. For those ports which show green marketing in strategy but not the other aspects, they could be mainly planners. If a port shows green marketing

**Table 1**  
Status of green marketing of top 30 ports in the world.

Rank	Port, Country	Port Authority/administration and governance	Strategies	Structures	Functions	Sum of Y
1	Shanghai, China	Shanghai Municipal Transport and Port Authority - Public institution under government department	Y	Y	L	2
2	Singapore, Singapore	Maritime and Port Authority of Singapore - Government statutory board	Y	Y	Y	3
3	Shenzhen, China	Shenzhen Municipal Port Administration Bureau - Government department	N	N	L	0
4	Ningbo-Zhoushan, China	Ningbo Municipal Port Administration Bureau - Government department	N	L	L	0
5	Hong Kong, China	Hong Kong Maritime and Port Board - Government agency	Y	Y	Y	3
6	Busan, South Korea	Busan Port Authority - Corporatized government body	L	N	L	0
7	Guangzhou, China	Guangzhou Municipal Port Administration Bureau - Government department	N	N	L	0
8	Qingdao, China	Qingdao Municipal Port Administration Bureau - Government department	N	N	N	0
9	Jebel Ali, Dubai, United Arab Emirates	Dubai Ports World - State-owned Corporation	Y	N	Y	2
10	Tianjin, China	Tianjin Transportation and Port Authority - Government department	N	N	Y	1
11	Rotterdam, Netherlands	Port of Rotterdam Authority - State-owned Corporation	Y	Y	Y	3
12	Port Klang, Malaysia	Port Klang Authority - Statutory corporation	Y	Y	Y	3
13	Kaohsiung, Taiwan	Kaohsiung Harbor Bureau - State-owned Corporation	Y	Y	L	2
14	Antwerp, Belgium	Antwerp Port Authority - State-owned Corporation	Y	Y	Y	3
15	Dalian, China	Dalian Municipal Port Authority - Government department	Y	N	L	1
16	Xiamen, China	Xiamen Port Authority - Government department	N	N	L	0
17	Hamburg, Germany	Hamburg Port Authority - State-owned Corporation	Y	N	Y	2
18	Tanjung Pelepas, Malaysia	Johor Port Authority - Government regulatory body	N	N	L	0
19	Los Angeles, U.S.A.	Los Angeles Harbor Department - City department of Los Angeles	Y	Y	Y	3
20	Long Beach, U.S.A	Long Beach Board of Harbor Commissioners - City department of Long Beach	Y	Y	Y	3
21	Laem Chabang, Thailand	Port Authority of Thailand - State corporation of Thailand	Y	N	Y	2
22	Saigon Port, Vietnam	Saigon Port Authority - Government-owned corporation	L	N	N	0
23	New York-New Jersey, U.S.A.	Port Authority of New York and New Jersey - Joint-state department of New York and New Jersey	Y	Y	Y	3
24	Bremen/Bremerhaven, Germany	Hanseatic City Bremisches Port Authority - Company on behalf of the Federal Land of Bremen	Y	Y	L	2
25	Jeddah, Saudi Arabia	Saudi Ports Authority - Government agency	Y	N	N	1
26	Tanjung Priok, Jakarta, Indonesia	Indonesian Port Corporation - State-owned enterprise	Y	Y	Y	3
27	Saigon New Port, Vietnam	Saigon Newport Corporation - Corporation under the Ministry of Defense	N	N	L	0
28	Valencia, Spain	Port Authority of Valencia - Public body under the Ministry of Development	Y	N	Y	2
29	Algeciras, Spain	Port Authority of Algeciras Bay - Public body under the Department of Public Works & Transport	Y	Y	Y	3
30	Jawaharlal Nehru, India	Jawaharlal Nehru Port Trust - State department under the Ministry of Shipping	Y	N	Y	2
Sum of Yes, No and Limited		Yes	20	13	16	49
		No	8	16	3	27
		Limited	2	1	11	14

Note: Y = yes the port is engaged in the activity in significant amounts; N = no engagement in activity; L = limited engagement in activity (Source: Authors, based on data from port official websites, reports and related references).

in structure and/or function but not strategy, it could be more of a reactive actor without comprehensive strategic planning.

### 3. Methodology

#### 3.1. Data collection

This research examines the green marketing efforts of the top 30 ports in the world in terms of cargo throughput handled according to World Shipping Council, which lists the top 50 ports in the world by TEU in 2015. The scope is wide covering ports from the three largest trade regions, namely Asia, Europe, and North America. Those ports beyond the 30<sup>th</sup> rank are much smaller, and extent of data availability varies a lot so it is the most suitable to benchmark the top 30 ports. The data collected for this research mainly comes from the official websites, annual reports and sustainability reports of the respective ports investigated, in particular based on the port authority/administration's information with reference to Parola et al. (2013) and Lam and Notteboom (2014). As explained in the introduction section, the port authority/administration is suitable for the analysis since it is the overall port planner, developer and promotor overseeing both marine and terminal aspects. The analysis is not based on individual terminal operators because the research question is green port, not only terminal nor company. Also, public sector organisations do require marketing efforts (Kaplan and Haenlein, 2009).

The data collected consists of the port's efforts in its green marketing

strategies, structures, and functions, following the green marketing framework of Karna et al. (2003) which is formed based on the literature. Green marketing in the framework of strategies, structures, and functions is useful for both private and public sectors (Domingues et al., 2017). The efforts in green marketing strategies can be sought from the port's mission statement, vision statement, values, and goals. These statements are usually laid down by top management and they set the direction for the port, of whether sustainability is being considered in its operations and development plans. As such, the overall port strategy is also analysed based on the port's mission and vision statements, as well as the port's publicly announced strategic direction. The green marketing structures refer to the organisational and management structure of the port. It comes in the form of defined roles and responsibilities for the sustainable development and environmental management of the port. Lastly, the effort placed in the marketing function refers to advertisement and communication of the port's sustainability initiatives. This could be in the form of news release, sustainability report or annual report that has information of the port's green performance or sustainable development. In the context of this study, the green port marketing tools include both business-to-business and business-to-consumer channels.

#### 3.2. Cross case analysis

To compare the top 30 ports in terms of their efforts placed on green marketing, cross case analysis is employed. Cross case analysis is a well-

established analytical method by which trends, similarities, and differences among the ports can be identified (Miles and Huberman, 1994; Stake, 2005). The key is to analyse the strategies, structures, and functions of the ports as a whole and on an individual level. Thereafter, the trend as a whole can be used to understand the current state of green marketing efforts in the world's top ports. The trend across the 30 ports on an individual level can be used to distinguish relationships between the port's ranking and their efforts in green marketing.

Through qualitative analysis, a port's extent of engagement in each aspect of green marketing can be determined accordingly. The coding process follows the research of Pagell and Wu (2009) in sustainable supply chain management. Y represents significant amount of effort placed onto the corresponding aspect while N and L represent no engagement and limited engagement, respectively. To classify as Y, the marketing aspect should include green port or environmental goals/actions/initiatives clearly. If a small extent is mentioned or involvement is not very clear, a L is recorded. As shown in Table 1, the numbers of Y, N and L are counted vertically to assess the overall effort of all port cases in each aspect of green marketing while the number of Y is counted horizontally to assess the efforts of each individual port. This shows the extent of efforts placed onto each aspect of green marketing across the cases altogether.

#### 4. Results and discussion

Table 1 shows the detailed results of green marketing of the world's top 30 ports. This section presents and discusses the findings at the overall industry level and individual port level, respectively.

##### 4.1. Industry level

From table 1, 18 ports or 60% of the ports have at least two 'Y' out of the three green marketing aspects. It gives the combined overview of the current state of green marketing across the 30 ports. It can be seen that overall, the count of 'Y' amounts to 49. More than half of the ports are regarded as significantly engaged in green marketing. This reflects the active approach taken by these ports due to the pressure from the development of environmental legislations and rising public awareness on environmental issues. However, the count of 'N' amounts to 27. There are 9 ports or 30% of the ports having no 'Y'. The count of 'L' is 14. Adding the count of 'N' and 'L', the number is 41 (vs. 49 'Y'). The findings reveal that still a significant number of ports are not engaging in green marketing at all or in a very limited manner.

The findings also give an overview of the current state of each aspect of green marketing across large ports in the industry. Results show that majority of the ports are significantly engaged in the strategies aspect of green marketing, followed by functions. On the other hand, majority of the ports are not engaged in the structures aspect of green marketing. Among the 30 ports, 20 of them or 67% are significantly engaged in the strategies aspect of green marketing. This means that majority of the ports included sustainable development or environmental management in their strategies. These ports show a high level of consideration for the environment in their long-term development plans. They are supposedly set to achieve green port status in the long run when they have emphasised sustainable development in their mission statement. For example, the Hong Kong Maritime and Port Board pledges to conduct port services and operations in an environmentally friendly manner.

16 out of the 30 ports or 53% are significantly engaged in the functions aspect of green marketing. These ports have been significantly engaging in sustainability or environmental initiatives and they report these initiatives on their website through the annual report or a separate sustainability report. These statistics and reports support the strategies aspect of green marketing by providing evidence that the port is indeed engaged in sustainable initiatives. Table 2 reports the ports' key green port project/initiative. There are different kinds of projects, but

reducing emission from ships is a popular one. However, there are several anomalies observed, for example, Tianjin Port does not place emphasis on sustainable development in their strategies but they report their engagements in sustainable initiatives. As another example, Kaoshiung Port places emphasis of sustainable development on their strategies but not as much green or sustainable initiative from their marketing channels. These ports are recommended to assess a possibility of greenwashing as there is insufficient connection between a port's strategies and functions from the green marketing perspective. In other words, these ports should refer to the 'strategy-structure-function' framework to enhance their green marketing efforts.

From Table 1, results show that the structures aspect of green marketing is not engaged by majority of the ports. Majority of the ports do not define roles and responsibilities for the environmental management or sustainable development of the port. Thirteen ports or 43% of the ports have engagements in this aspect. For example, the Maritime and Port Authority of Singapore has the Marine Environment and Safety Department under the Port Division that enforces environment protection in the daily port operations that is easily contactable. The lack of popularity in defining roles and responsibilities in the organisational structure of a port showing to the public is probably due to the perspective of the port management that an environmental management department has little or no profitability as compared to other departments. When a port sets a green marketing strategy but its structure and function do not provide support to implement the strategy, the port is mainly at the planning stage. Its green marketing orientation is towards a planner, and not yet an actor.

##### 4.2. Individual port level

Table 1's rightmost column 'Sum of Y' gives the individual port assessment on their efforts in green marketing. Fig. 2 shows a scatter diagram visualizing the green port marketing results. There are 10 ports representing 33% of the 30 ports with 3 counts of 'Y'. They are regarded as proactive green marketers who demonstrate consistency between planning and actions. There is no observed trend or pattern in the amount of effort placed on green marketing with respect to the volumetric throughput ranking and governance structure of the ports. These proactive green marketers range from busy ports like Singapore (rank 2 in TEU throughput) to smaller ports like Algeciras (rank 29 in TEU throughput) and their governance structure differs. We find that 5 ports with 0 count of 'Y' come from the top 10 ranks whereas 3 ports from the bottom 10 ranks have 3 counts of 'Y'. The research shows that smaller ports are not disadvantaged in green port marketing and can be active in sustainable development. In terms of governance, some proactive green marketers are government statutory boards/agencies while some are state-owned corporations. This finding reinforces the point that public organisations can be active in green marketing.

It is observed that out of the 9 ports with 0 count of 'Y', 5 come from China. These 5 ports are namely, Shenzhen, Ningbo-Zhoushan, Guangzhou, Qingdao, and Xiamen. This trend can be explained by the observation that majority of China's ports and transport sector place emphasis on capacity, efficiency and volumetric output (Li et al., 2018). In terms of their marketing orientation, the 5 ports are considered as non-green marketers. By investigating their overall port strategy, these ports set their direction as a global (container) hub port (see Table 2). For example, the Qingdao port website and reports did not mention sustainable development in any of its strategies, mission, vision or goals. Its plans for the future mainly comprises the strengthening of port infrastructure, automation, integration of the port layout plan with the city's industry, transportation and logistics planning, and the modernisation of the port services. The other Chinese ports have mainly 1 count of 'Y'. In general, many Chinese ports in the sample do have green port projects as shown in Table 2, but they do not prioritise green marketing. However, Hong Kong being a Special Administrative Region of China having a longer history of port development has 3 counts of

**Table 2**  
Overall strategy and key green port project/initiative of top 30 ports in the world.

Rank	Port, Country	Overall port strategy	Key green port project/initiative
1	Shanghai, China	Leading global hub port	Shanghai Green Port Three-Year Action Plan
2	Singapore, Singapore	Premier global hub port	Reduce 25% port dues for qualified ships
3	Shenzhen, China	Global Container hub port	Shenzhen Green and Low-Carbon Port Five-Year Action Plan; Subsidy for cold ironing and low-sulphur bunker oil
4	Ningbo-Zhoushan, China	Global Container hub port	Ningbo's The Thirteenth Five-Year Plan on Green Transportation
5	Hong Kong, China	Major maritime services hub	Going Green at Government Dockyard
6	Busan, South Korea	Global hub port	Busan Port VISION 2030: Realizing the Green & Safety Port strategy
7	Guangzhou, China	Global hub port	Guangzhou's Thirteenth Five-Year Plan on port and shipping: lower carbon emission
8	Qingdao, China	Global hub port	Qingdao fully automated container terminal
9	Jebel Ali, Dubai, United Arab Emirates	To be a world trade leader	Smart Port initiatives: e.g. adopting latest technology in container terminal 3 resulting in 30% carbon efficiency
10	Tianjin, China	Global hub port	Tianjin's Thirteenth Five-Year Plan on Transportation: Green transportation
11	Rotterdam, Netherlands	A logistics hub and world-class industrial complex	Rewarding vessels with Environmental Ship Index (ESI) or Green Award certification with discounts on port charges
12	Port Klang, Malaysia	Preferred Logistics Hub for The Asian Region	Green technology in port operations in Northport and Westports
13	Kaohsiung, Taiwan	Container transshipment hub port and comprehensive value-added logistic port	Port of Kaohsiung 2040 Master Plan: Developing a green port
14	Antwerp, Belgium	A Home port as a lever for a sustainable future.	Business plan 2018–2020: towards low-carbon and sustainable port
15	Dalian, China	International shipping center and international logistics center	Dalian Municipal Port Authority the 13th Five-Year Plan: promoting green port development as one of the key objectives
16	Xiamen, China	International shipping center, International transshipment hub	Xiamen green port development 13th five-year plan
17	Hamburg, Germany	Maintain and extend the position as Germany's leading transshipment hub	Goals related to green port up to 2025: e.g. reducing energy consumption by 5% as compared to 2015
18	Tanjung Pelepas, Malaysia	Preferred port	JPA Green Port Policy 2014–2020: framework for green port development
19	Los Angeles, U.S.A.	The premier gateway for international commerce, a global model for sustainability, security, and social responsibility	Clean Truck Program; Electrification; Ocean-going vessel emission; Reduce port dues for ships with high Environmental Ship Index
20	Long Beach, U.S.A	An international gateway for the reliable, efficient and sustainable movement of goods	Reduce air emissions; electrification; improve the quality of harbors' water; protect and maintain aquatic ecosystems and marine habitats
21	Laem Chabang, Thailand	Multimodal Transport and Logistics Center of ASEAN	Conserve mangrove forest resources; electrify yard cranes
22	Saigon Port, Vietnam	N/A (the port has been re-structured. Currently, operation is very limited)	N/A
23	New York-New Jersey, U.S.A.	Facilitating the efficient movement of people and goods through the region	Clean air strategy; financial incentives for slow-steaming operation; Electrify port cranes
24	Bremen/Bremerhaven, Germany	Amongst the most important universal ports in Europe	Discount for vessels with high Environmental Ship Index or powered by LNG
25	Jeddah, Saudi Arabia	Being the country's main commercial port	N/A
26	Tanjung Priok, Jakarta, Indonesia	Indonesia's gateway to the world's trade	Electrify yard cranes; sewage treatment; monitor ambient air quality and water quality; reduce air emissions by improving port efficiency
27	Saigon New Port, Vietnam	A leading container port in Vietnam	N/A
28	Valencia, Spain	Exploitation of the port's capacity as a mixed hub, optimising port call costs and volume/mix of local import-export	Monitor and control the water quality and noise emissions
29	Algeciras, Spain	To consolidate as an intercontinental logistics staging platform and hub port that is an intermodal benchmark in the Mediterranean	Use LNG as a marine fuel and exploit LNG in land uses
30	Jawaharlal Nehru, India	The premier container port of South Asia	Environment Management and Monitoring Plan; development of an Eco Park

Source: Authors, based on data from port official websites, reports and related references.

'Y'. Notably, Tanjung Priok, ranked 26th in the world, also has 3 counts of 'Y'. Another good example is Algeciras Port, ranked 29th in terms of cargo throughput, which also has 3 counts of 'Y'. These smaller ports set good examples in green marketing for other ports which have yet to commit more in sustainable development.

It is also found that the European and American ports are generally active in green marketing. These ports mostly have 3 counts of 'Y', except for the 2 German ports and Valencia, Spain having 2 counts of 'Y'. Europe and the U.S. have started green initiatives in their port sector relatively earlier. Correspondingly, their ports' green marketing efforts are more mature and comprehensive. The results are in line with Lam and Notteboom (2014) claim that European port authorities would have a higher level of influence on formulating green port policies in comparison to Asian ports.

#### 4.3. Practical implications and recommendations

The analysis above provides benchmarking across major ports and shows that there is much room for improvement with regards to green

marketing for some ports. In this section, specific examples of the good green marketing practices derived from the 30 ports are discussed following the theoretical framework with the components of marketing strategies, structures, and functions.

Firstly, good practices with regards to strategies can be seen from several ports. For example, Long Beach clearly specifies that environmental stewardship is one of the port's strategies. Both Port Klang and Antwerp mention that they are working towards becoming a sustainable port in their mission statements. This could also be in the form of organisational goal or vision. This green marketing strategy aspect reflects that top management of the ports are committed to environmental sustainability. These ports use green marketing to differentiate themselves from competitors. These are good practices that set the direction for the ports towards sustainable development.

Secondly, good practices with regards to structures can be seen from both Singapore and Antwerp ports whereby the Marine Environment department can be easily located from the organisational chart. It is especially convenient when the Maritime and Port Authority of Singapore provides the contact number and email address of the Marine

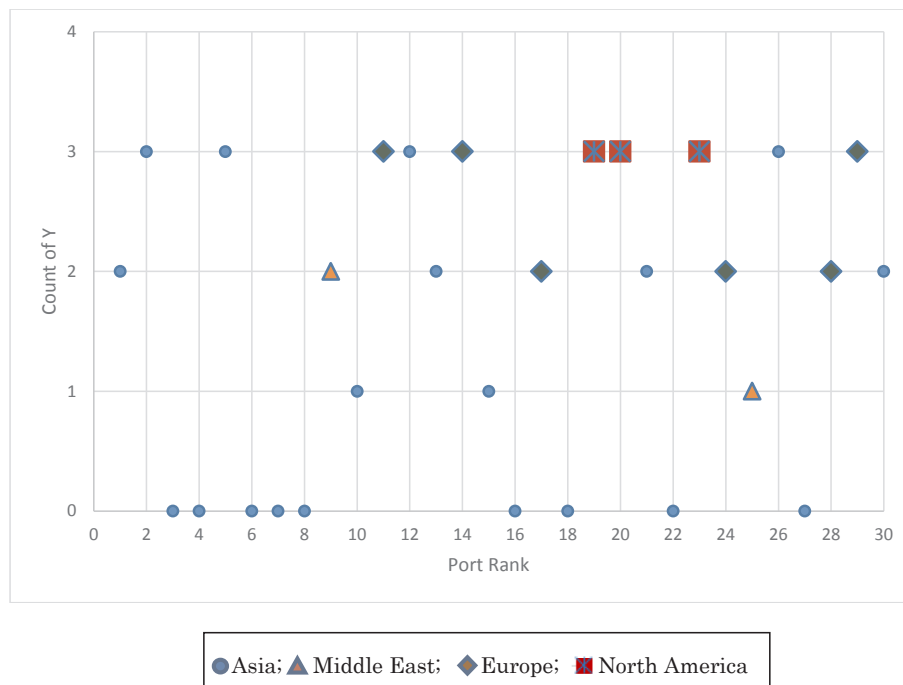


Fig. 2. Scatter diagram showing green port marketing results. Source: Authors.

Environment and Safety Department on the website. On the other hand, Port Klang does not have the environmental department in its organisational chart. The defined role and responsibility of environmental management could only be found in its annual report.

Thirdly, there are several practices with regards to functions that can be seen from the ports in the form of annual reports, sustainability reports, news releases, and publications. For example, Rotterdam Port's annual reports have sections dedicated to sustainable development. News releases and newsletters that mention plans or developments on sustainable initiatives are also common amongst the ports. Hong Kong, Rotterdam, Antwerp, Los Angeles and Long Beach ports have a separate environmental or sustainability report specifically for statistics and information about the port's sustainable initiatives. Singapore port has webpages specifically for its Maritime Singapore Green Initiative that is comprehensive. This green initiative comprises the Green Ship Programme, Green Port Programme and Green Technology Programme which ultimately aim to promote clean and green shipping in Singapore with minimal environmental impact. Rotterdam and Antwerp ports have websites specifically dedicated to the ports' sustainable initiatives and these websites are very informative. The websites contain details of the port's plans, programmes and actions that contribute to their sustainable development. All of the above mentioned are good practices that demonstrate the port's contribution to the protection of the environment.

On the other hand, there are several ports that require improvement. Such implications include reports that are not available in English and reports that are outdated. 'Google Translate' was used for the translation of foreign language to English for this research to minimise the language barrier. However, there are still some limitations. For example, the Shanghai port's annual report is in the Chinese language and Hamburg port's annual report is in the German language. Also, certain ports did not update or release the latest reports on their website. Therefore, the old reports do not reflect the current state of the port's efforts in sustainability or environmental management. For example, Port Klang's annual reports are up till 2016 at the time of writing this article (2018).

Generally, ports could come up with new ideas or follow the current

practices to advertise their sustainable initiatives. However, it is important to have a connection between the strategy, structure and function aspects of green marketing. Such a port is truly a green port marketer with a clear long-term vision and tangible actions for implementation. What matters to customers and authorities is that marketing efforts are representative of a real stance on sustainability. Else, there is a risk of greenwashing and the credibility of the port drops. We note that there are 3 ports having 1 count of 'Y'. The ports' green marketing orientation is considered a reactive actor. A lopsided focus on only one aspect of green marketing is insufficient for sustainable development. A green marketing strategy that is unfunded or unimplemented will most likely damage the port authority's reputation. These ports may take reference from the research findings for enhancing their green marketing efforts.

Furthermore, it is important to note that a green marketing strategy should be aligned with the overall strategy of the port. In a more generic sense, a marketing strategy should support the overall port strategy. Firms or organisations that develop marketing strategies that are not in alignment with actual corporate culture or overall strategy would risk doing more harm than good (Sharma et al., 2010). If a port authority has identified that the port strategy is not green or sustainable port, it is appropriate not to conduct green port marketing promotion. In other words, for the wellbeing of the port, it is better not to wrongly market being green if the port does not concentrate on sustainability. This argument can justify the positioning of some Chinese ports as discussed in section 4. Nevertheless, this does not mean that the ports do not take green initiatives, just that they focus on other marketing aspects such as port efficiency and high quality services.

### 5. Conclusions

According to the cross case analysis conducted, more than half of the 30 cases are actively engaged in green marketing. The ports that are not actively engaged in green marketing are probably not to be branded as green ports, at least from the public's perspective. Thus, the findings suggest that these ports do not place priority on the environment in terms of pollution prevention, clean technology, clean shipping, and

clean port services.

While it is commendable that a sizeable number of major ports in the world are actively engaged in green marketing, it is imperative that there is a connection between the strategy, structure and function aspects of green marketing which are all essential. The strategy aspect is the ‘what’ part, the structure aspect is the ‘who’ part and the function aspect is the ‘how’ part. It is found that the ports under investigation focus more on strategies, and less on structures and functions. While it is vital to set the long term strategies, the structure aspect specifies the roles and responsibilities of the people in the port for implementing the goals. The function aspect gives evidence of green efforts in terms of statistics and reports that are quantitative and measurable. Especially when the port authorities/administrations are the key planner and developer, they set the direction for the entire port. Therefore, sustainable initiatives start out by the port authorities/administrations would have the biggest impact on a port. However, there is a risk of greenwashing when ports ‘talk’ but did not ‘do’, thus, it is important for the ports to publish reports or statistics to support what they ‘say’ for green marketing to be effective.

This paper analysed the state of green marketing of the top 30 ports in the world. Several good green marketing practices that are seen in some ports were discussed. To the authors’ knowledge, this is the first study on green port marketing in the literature. The paper advances knowledge in the literature by employing a green marketing framework to examine ports. Specifically, the marketing framework ‘strategy-structure-function’ is newly applied and analysed in ports. An original theoretical framework deriving green marketing orientation is formed. The cross case analysis adds value by representing an international perspective from the major ports in the key geographical regions. It also contributes to practice by identifying patterns and trends across the various ports for benchmarking. The research design may also be useful for other green marketing studies. Nevertheless, research limitations exist. This study investigated the ‘what’, ‘who’ and ‘how’ aspects of green port marketing, but the ‘why’ is yet to be explored. That is, the finding is unable to tell why some ports spent more efforts on green port marketing. For future research, in-depth case studies can be conducted using the same green marketing framework. A survey with the ports can also be performed to collect primary data for investigating research questions such as motivations for sustainable initiatives, difficulties in their implementation, and relationships between green marketing and port performance.

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