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Regulating global shipping corporations' accountability for reducing greenhouse gas emissions in the seas

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ABSTRACT

Up until the recent oil and commodity price crash in 2015, there has been exponential growth in global shipping and trade, and this increase means that prompt action is required to reduce vessel-sourced greenhouse gas (GHG) emissions. Future projections suggest that maritime CO_2 emissions will increase substantially by between 50% and 250%. However, there is currently no international instrument holding global shipping corporations accountable for their vessels' performance in emissions reduction. This article critically assesses the current accountability practices and regulations in place for these corporations. It suggests that stakeholders in this industry need to further explore the market based mechanisms (MBMs) that can encourage and even demand that these corporations systematically disclose their vessels' emissions reduction performance in an accurate and timely manner. Developing such mechanisms is vital to assist in the reduction of GHG emissions since a comprehensive international instrument is unlikely to be implemented soon.

1. Introduction

Worldwide shipping trade provides opportunities as well as challenges in the face of globalization. On one hand, shipping corporations are expanding sea based cargo shipments [18,57] and on the other hand, depletion of resources and environmental pollution caused by vessels is increasing rapidly [67]. Marine vessels owned and operated by corporations account for about 3% of total global greenhouse gas (GHG) emissions ([49, p.2]; [78,113]). This amount is substantial and growing fast. It is argued that if no action is taken, the amount will increase to 18% by 2050 [49]. This is counter-productive to international efforts to keep the global warming temperature increase "to well below 2 °C above pre industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels [111, p.2] [1].

Against this backdrop, improving the role of the shipping industry in the reduction of GHG emissions from marine vessels is a serious concern (see, for example, [15]). The shipping industry, the International Maritime Organization (IMO), and governments in various states work together to minimize such emissions [74] and the resulting impact on climate change [44,82,91,98]. The Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) specifically urges the developed states to take the lead to reduce vessel-sourced GHG emissions on a Common but Differentiated Responsibility (CBDR) principle. However, because of difficulties in allocating and capturing emissions discharges in international sea space, an emissions apportionment is complex shipping industry (see, for example, [35]). Currently, the aviation industry appears to be responding with a global trading scheme for aviation emissions and utilizing sustainable fuels [14]. Complicating the implementation of similar market based mechanisms with shipping are the tension between CBDR which allows for different levels of effort tied with economic development and the maritime principle of "no more favourable treatment" which means that all shipping nations are treated equally [14, p.689]. Nonetheless, efforts to reduce GHG and non-GHG emissions may lead to significant increases in transport costs and thus drive positive externalities for ship owners to reduce fuel expenditure and thus reduce emissions further. However, promising options are always matched by barriers in the shipping industry such as the industry's complexity, infrastructure lock-in and the necessity for individualized vessel based interventions [35].

The IMO, a United Nations body working with maritime shipping, has developed a protocol, namely, the *International Convention for the Prevention of Pollution from Vessels* (commonly known as 'MARPOL'). This is, by far, the most significant legal instrument worldwide covering all the relevant areas of shipping with specific details [105, p.196]. It outlines the technology, which must be used

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to reduce sulphur oxide emissions and has introduced new design criteria for vessels to ensure efficient energy use. *The United Nations Convention on the Law of the Sea* (UNCLOS) details the sources of marine pollution and the duties and responsibilities of states in this area. Apart from these international instruments, there are many other tools in place to regulate the marine environment and pollution reduction, which have been adopted under the auspices of the IMO and other global organizations.[2] Unfortunately, none of these instruments adequately focuses on shipping corporations' accountability for effectively reducing vessel-sourced GHG emissions. Parties to these instruments are the nation states. They rarely dictate procedures for shipping corporations to reduce vessels' GHG emissions. For instance, the MARPOL describes a procedure for managing various sources of ship-generated pollution in its 6 annexes. Annexes I and II are about oil and chemical induced pollution regulation and they are compulsory for the states parties. There are some procedures to regulate air pollution from marine vessels in Annex VI of this instrument, but implementation of these procedures by states parties is optional. Moreover, these procedures do not cover GHG emissions from marine fossil fuels. Under this protocol, the control of shipping emissions at the domestic level was passed to developed nations. Thus, the reduction of emissions from international shipping is facilitated by the developed nations working with the IMO. Therefore, countries are largely responsible for their own territorial waters. Unfortunately, most of them are reluctant to develop policies and infrastructure to regulate the emissions issues pertinent to the vessels in their territorial waters.

The IMO is a member-states led organization and it requires mandates from its members to be able to have policies on international shipping. Getting such mandates, however, is historically a challenging task. Prior to the Kyoto Protocol's adoption in 1997, the convention's Subsidiary Body on Technical Advice suggested that the member states consider five options for effective control of emissions from international shipping, but no decision was made as agreement could not be reached on their importance.[3] Nevertheless, negotiations are currently underway in the Marine Environment Protection Committee of the IMO for the adoption of a universal instrument for GHG emissions reduction from marine vessels. Unfortunately, the way in which this negotiation process is progressing does indicate that an instrument will not be implemented in the near future. Likewise, even with the adoption of the Kyoto Protocol (which imposes a legally binding emissions reduction target only on the developed states), it is doubtful that these states, as listed in the Annex I of the UNFCCC, will adopt any GHG emissions reduction related instrument based on the CBDR principle in the near future [53,55]. The 15th Conference of the Parties of the UNFCCC approved a work plan for a binding instrument and this was due to be considered at the 60th Marine Environment Protection Committee (MEPC) meeting. But no decision was reached at the MEPC meeting [70,71]. That said, this paper does not seek to undermine the CBDR principle, instead, it proposes an alternative New Governance approach to improve efficiencies in the vessel-sourced GHG emissions reduction regulatory framework at the international level [65,104].

None of the instruments within the current global regulatory framework describe how large shipping corporations are to be accountable for the reduction of their vessels' GHG emissions. We propose holding global corporations accountable for their performance to their wider stakeholders is a market-based mechanism (MBM) and it has been proven to be effective in some industries to enhance the responsible behaviour of large corporations that operate in a highly competitive market with sensitive brand images. One particular strength of this mechanism is that it can expose corporations to the threat of losing their competitive edge in the market. It can also allow consumers to pressure corporations to act responsibly. These pressures or forces can be operational in various ways. The creation of a regulatory framework, which compels corporations to disclose necessary information in an effective manner, is becoming an increasingly popular method. Hence, the way in which a shipping corporation delivers information on their vessels' GHG emissions to authorities, if not to the general public, is vital for regulating vessel-sourced GHG emissions, in the absence of any particular international instrument.

Interestingly, academic literature on the global shipping corporations' (such as Maersk or Mediterranean Shipping Lines) roles in reducing their vessels GHG emission is negligible.[4] This article is an attempt to fill this void. The remainder of this paper is as follows. The second section provides a brief definition of 'accountability' followed by discussions on shipping corporations' accountability in the third section. Section, 4 discusses corporations' accountability regulations. Having established that improving shipping corporations' accountability is vital for reducing vessel-sourced GHG emissions, the fifth section of this paper critically evaluates the current accountability practices of the top 10 global shipping corporations. Section six assesses the current emissions reduction mechanism, and permits GHG emissions reduction performance disclosure as a MBM to improve shipping corporations' roles in the emissions regulation framework. Section seven concludes the paper.

2. Accountability

Before assessing the accountability regulation of the global shipping corporations at the international level, a note on the meaning of 'accountability' as used in this paper is important. It is important in the sense that this word is 'somewhat multi-faceted and, indeed, a 'murky' term that does not lend itself to precise definition' ([19]; Sinclair, 1995). Although there is a distinct lack of consensus within the socio-political, environmental and accounting domains as to its meaning, in general, 'accountability' denotes 'the duty to provide an account (by no means necessarily a financial account) or reckoning of those actions for which one is held responsible' [19,36]. This is based on the principle-agent theories where 'an agent, who is the accountable actor, must answer to the principle, who is the accounter' ([3,66]; Ross, 1973). Indeed, within the various meanings of 'accountability', there is a trend to define this term from the perspective of one of the actors. From the accounter's perspective, this term 'addresses how the accounter's goals can most effectively be achieved, or how the accounter can influence the accountable one to achieve what the accounter wants' [3]. From the accountable's perspective, this term focuses on how the accountable mechanism created mostly by the accounter can psychologically and behaviorally impact the accountable actor. Accordingly, studies that focus on the accounter actor often explore mechanisms for clarifying goals to that actor, and discuss 'consequences for the accountable actor based on success in achieving the accounters' desires' [3]. Studies on the accountability of accountable actors focus on how these actors act when they are held 'accountable' [68,106]. The underpinning of these concepts is 'the construction of individual moral worth and the acknowledgement of that worth by the assignment of credit or blame for individual actions' [3]. As such, accountability will be defined as a concept within which credit and blame are deeply entrenched and both the actors maintain relational transactions that can 'lead to increased efficiency, effectiveness and justice' [3,87,88]. Edwards and Hulme define accountability as 'the means by which individuals and organizations report to a recognized authority (or authorities) and are held responsible for their actions (Edwards and Hulme, 1996, p. 967).

Accountability has both the elements of answerability and

enforceability [99]. While answerability is the obligation to offer explanations of actions and reactions, enforceability refers to the realization of that obligation and implementing sanctions in the case of nonfulfillment. Taking into consideration these core components, accountability regulation is designed to maintain a clear understanding about the performances of corporations, to fulfill the needs of stakeholders. When stakeholders deal with a corporation, their interactions are guided by their perceptions of the corporations, and not by what the corporation wants them to perceive. Therefore, corporations need to be seen to be fulfilling their commitments in the eyes of the stakeholders. One of the ways to do so is by being transparent (Soobaroyen and Mahadeo, 2012, p.338). The pressure for corporations to be transparent comes about through the publishing of information, so that interested parties can evaluate whether the corporations are well on track, or whether they need corrections. Therefore, the operational definition of accountability, very often, becomes limited to reporting to the designated parties in which one party justifies actions to another party, such as customers, investors and regulators (Ebrahim, 2003; Tetlock, 1983).

There are varying opinions regarding to whom, and about what, corporations are accountable. The degree of accountability may be defined by the number of relationships in an organization. Researchers argue that accountability can be attributed to both external and internal people (Cornwall et al., 2000) and it can be ensured in either a formal or informal way (Edwards and Hulme, 1996, p. 967). While the formal mechanisms include, but are not limited to, formal reporting, reward and punishment systems, performance evaluation, and supervisory leadership training, informal mechanisms include group norms, cultural norms, and loyalty to the organization amongst others (Frink and Klimoski, 2004, p. 3).

This research focuses on the formal accountability to stakeholders that shipping corporations have in reducing their GHG emissions. This is important because currently shipping corporations, as a whole, do not have well-accepted accountability practices for GHG emissions reduction responsibilities. Indeed, whom corporations should be accountable for their performance, is not clear (see, for example, [75]). Evidence from other industry sectors suggests that companies which display stronger Environmental Management Systems and corporate governance tend to be larger in size and use voluntary GHG disclosure to gain competitive advantage [92]. Nonetheless, GHG emission disclosures may also be used as tools to legitimize environmentally sensitive companies in the eyes of stakeholders (see, for example, [89]). In the shipping industry more specifically, accountability mechanisms and external disclosure requirements are insufficiently dealt with in the global regulatory framework for the reduction of vessel-sourced GHG emissions.

3. Shipping corporations' accountability regulation

Similar to the concept of accountability, the definition of regulation is unclear too, as it covers very broad areas of state control over social and economic activities, including various forms of unintentional and non-state actions [8,13,86]. Nonetheless, it is widely accepted that regulation refers to anything that controls or influences the activities in which society is an important aspect [48,100]. Such control or influence is purported to prevent undesirable behaviour, actions and activities, and to enable and encourage desirable ones [7,9,31]. To this end, regulations may include policies, norms, market principles, business codes, international principles and covenants designed to affect social and economic behaviour and activities [81,115]. Accordingly, all law is regulatory in nature [84].

The aim of regulation varies with the objectives of regulators in different contexts. One of the predominant aims of creating regulation is to render the behaviour of regulatees consistent with market principles and widely-valued social norms by emphasising greater efficiency and flexibility in internal management. For this, regulatory strategies are increasingly used to improve compliance with environmental standards [47,52], the implementation of occupational health and safety guidelines [39,50,101], the involvement of stakeholders, inclusion of equal opportunities [73,79], ethical standards [24], and the adherence to principles of fair competition in business and society [85].

The regulation on vessel-sourced GHG emissions reduction, however, has never been considered to be straightforward [72,96]. For some time world leaders have been attempting to reach agreement on this issue, but historically have failed [25,41]. Leaders believe that the positions they should hold are dependent on whether they are from developed or developing states, and subsequently, cannot agree on which actor in the global ocean based cargo shipment chain should assume what proportion of accountability [90]. Within these limitations, the IMO continues to work to ensure that the shipping industry abides by responsible business practices, by designing various guidelines [45].

As mentioned earlier, the MARPOL is a significant instrument, which has been developed by the IMO. Though the regulatory framework described in the MARPOL is considered to be favourable by many, implementation of the procedures and standards mentioned in it has become a major challenge. Shipping is a very complex business involving stakeholders both on land and in the water. To add to the complexity, these stakeholders come from different states and are subject to different laws, values, norms, and cultures. In this business, shipping corporations and their vessels may be registered in different states. Vessels will use ports across many states, and crewmembers may be from other states again. Ships will also travel through the waters of other states as well as international waters.

This means that there is large-scale diversity in trade, and it is not easy to govern all shipping trade under one scheme. The first challenge encountered with the introduction of the MARPOL was during ratification; not every nation state agreed to ratify all of the annexes. For example, the United States recognizes all annexes but Annex IV [20, p.8]. Another problem became evident with the ambiguity of the convention and the slow rate of cooperation by the affected parties. Under the MARPOL convention, a vessel can be inspected by the hosting state for emissions levels or any environmental violations. If the emissions level is higher than the acceptable range, the country can detain the ship. But when the vessel is in water that does not belong to any jurisdiction or it is not possible to determine the jurisdiction, the responsibility goes to the flag state (the state where the vessel has been registered). Historical records show that the cooperation that is required in the second case is weak and the response from flag states is poor [20, p.9].

The foresight of the IMO regarding shipping corporations' accountability for GHG emissions reduction performance can be questioned too. This organization keeps its activities limited to the rights and responsibilities of the state parties. It does not suggest that its members focus on shipping corporations' responsibility for GHG emissions reduction. It has even hesitated, several times, to define a common standard for measuring emissions from the vessels. For instance, in the determination of acceptable ranges for sulphur emissions, this organization has frequently changed its position. Though the world average was in between 2.5% and 3.5%, the IMO fixed a global cap of 4.5% for sulphur emissions. This has been criticized for not being sufficiently stringent. The EU was so critical of the figure that it decided on a smaller cap of 1% within the EU zone [59].[7] The IMO later made amendments and reduced

the fixed cap to 3.5%, which has been in effect since 1 January 2012.[8] This later change to reduce the cap on sulphur emissions demonstrates that the IMO has been working on a trial and error basis with regional politics influencing its policy design process. In its Resolution 963/23, this organization called upon its members to adopt a market based instrument for the reduction of vessel-sourced GHG emissions. However, 10 years after the adoption of this resolution, and more than a decade after the adoption of the Kyoto Protocol, it is still struggling to reach a conclusion on the type of this instrument ([58,63,14,61]).

Indeed, it is difficult for the IMO to create a single point of unity considering the diversified nature of the shipping business [102]. Differing economic conditions across member states is also of importance. Member states with strong economies are generally the states of origin of the top global shipping corporations. Likewise, some of these states are the major contributors to global GHG emissions. Almost all of these states are reluctant to have any policies that differentiate between the obligations of the developed and developing states. However, developing state members tend to display a reluctance to implement any specific emissions reduction commitments. Compounding this never ending problem is the obstacles, which are evident in the implementation of any protocol in developing states. This is another reason for a lack of global policy on vessel-sourced GHG emissions reduction. Developing states do not have enough resources to implement these kinds of protocols, and their control over the activities of global corporations is negligible. They have neither the equipment to implement the protocol nor the financing to afford the required equipment. These states often request financial support from developed states, and this continues to be a point of contention. Unfortunately, the IMO have not developed any guidelines in this area.

Article 207 of UNCLOS details responsibilities for the states to establish global and regional rules, standards and practices for controlling pollution of the marine environment from land-based sources, 'taking into account characteristic regional features, the economic capacity of developing states and their need for economic development.' According to Article 211(1) and 212(3) of the UNCLOS, the state parties are responsible for establishing global rules and recommended practices and procedures for preventing vessel-sourced marine pollution. They are also obligated to assist international agencies like the IMO. However, there does not seem to be any kind of firm commitment by the states in this area, and this has also resulted in the lack of proper accountability practices by shipping corporations. In the first week of December 2014, representatives from 195 states gathered in Lima for two weeks to discuss climate change policies that are scheduled to be approved in the Paris meeting in late 2015 [72]. They discussed the policy terms and wordings, and it was reported throughout the media that no platform was unanimously agreed upon [5,46,83, p.6]. While the USA, China, and the European Union commit to their emissions reductions, other important nations, such as Canada, Australia, Japan, Russia, South Africa, Brazil and Indonesia have not made their positions clear.

All of this means that there has been a notable underdevelopment of global policy to facilitate the active reduction of vessel-sourced GHG emissions. For the shipping business, the problem with the current GHG emissions reduction regulation framework is that it does not place emphasis on the development of self-regulated accountability practices. The IMO has no policy, let alone any specific procedure, for the development of criteria for corporate design of emissions reduction related activities. Likewise, none of the international organizations working on environmental pollution reduction have policies to assess corporate performance in GHG emissions reduction for the shipping trade. This has a serious impact on vessel-sourced GHG emissions reduction programs. According to a scientific study, 'by 2050, in the absence of policies, vessels' emissions may grow by 150% to 250% (compared to emissions in 2007) as a result of the growth in shipping' [56,62].

4. GHG emissions and the accountability practices of the major shipping corporations

Measuring the amount of carbon emissions from sea vessels is a difficult task. This is mainly due to the complexities in emissions measurement methods, rather than the fact that the vessels are usually located in deep ocean waters. There are many methods for this measurement and frequently, the results based on these methods do not match each other [74]. For instance, Corbett and Köhler [21], Endresen et al. and Eyring, Köhler, Van Aardenne, & Lauer estimated emissions based on fuel consumption, but did not get the same results [16,30,33]. To carry goods, shipping lines consume fossil fuels, the by-products of which are the main sources of emissions. There are two types of emissions that are produced from the consumption of fossil fuels: GHG emissions and non-GHG emissions. While carbon dioxide (CO_2) is the main component [91] of GHG emissions, non-GHG emissions include sulphur oxides (SOx), nitrogen oxides (NOx), and particulate matter (PM). The emission of CO_2 comes from two different types of activities: port related and en route activities. Port related activities include entering or leaving a port along with activities relating to vessels' staying in their berth. En route activities refer to methods of speed reduction and the cruise phase in the open ocean. In almost every case, en route related activities produce the maximum amount of carbon emissions [45]. Among non-GHG emissions, SOx receives the most significant attention (after CO_2) due to its negative effect on the environment.

Researchers usually estimate data on vessel-sourced CO_2 emissions based on different parameters, like the vessels' engine power, amount of fuel used, and number of days at sea. In the absence of a commonly agreed single method to estimate the volume of emissions, corporations are entrusted to provide data based on the figures generated by their own choice and method. In addition to that, while at sea, vessels do not report their speeds and routes [45], both of which have a positive correlation with the amount of carbon emitted [91]. New methods are being developed to better monitor individual ship emissions using Automatic Identification System data for example [109]. However, these methods are not widely adopted in practice yet.

To gain a better understanding of current accountability and reporting practices in the global shipping industry, the section below assesses the environmental disclosures of the leading global shipping corporations. It first explains the sample of the disclosure documents; secondly, methods for analyzing these documents; and finally, the results of this analysis.

4.1. Sample size

The section below assesses the levels of CO_2 emissions from the top 10 shipping corporations of the world and their emissions reduction performance related accountability practices. Shipping corporations deliver their accountability information in various ways, among which their annual report is the flagship document. We assessed the Annual reports of the 10 largest shipping corporations for 5 years starting from 2009 were assessed.

The above top 10 corporations were selected based on the ranking produced by alphaliner.com. The ranking has been cross checked with other rankings produced by insidermonkey.com, supplychaindigital.com, and therichest.com. Most of the available rankings agree with the ranking of alphaliner.com. Among these

10 shipping corporations, the Mediterranean Shipping Company is privately owned and CMA-CGM has only one annual report on its webpage. Therefore, these two firms have been excluded, reducing the final sample size to eight.

4.2. Methods for content analysis

The research applied a content analysis technique to collect data from the annual reports of the selected shipping corporations. The first stage of this analysis was the selection of the recording units to be coded in the analysis. The second stage was the selection of the unit of measurement (or enumeration) with which to quantify the results [22]. Units included in this content analysis are the number of words [26,27], number of sentences [108], number of pages [23], percentage of pages [112] and percentage of total disclosure [110]. The codes were tested on sample annual reports to develop the final coding instrument. To enhance the reliability of the coding instrument, a test was employed to undertake a proportion of the content analysis task, with a view to later examining the amount of intercoder agreement. The coding instrument and instructions were refined until a high level of agreement was achieved. This approach is a better indication of the reliability of the data than a pre-test/ post-test as 'it is sensitive to more than the internal noise or inconsistencies of one coder' [22,64]. The qualitative content analysis adopted in this paper enables a richer understanding of the way in which individual shipping corporations are approaching accountability towards GHG emissions in their operations. Annual reports are used as a mechanism by which to understand the level to which shipping corporations disclose information on their GHG performance. Thus, it provides some measure of the extent to which shipping corporations are be willing to be accountable and held to account by stakeholders.

4.3. Results

The aim of this content analysis was to understand the trend in global shipping corporations' environmental disclosure practices, with a particular focus on the frequency of their disclosures, GHG emissions reduction commitments and performances, and the overall importance of environmental issues in their internal regulations. This analysis explicated that (i) most of the top 10 global shipping corporations do not have an accountability practice of regularly disclosing their sustainability performances to their stakeholders and, (ii) they do not disclose GHG emissions reduction related information adequately in their annual reports. Below is a discussion on these two results.

4.3.1. Corporations do not publish their accounts

Shipping corporations around the world have diverse disclosure practices. Some corporations publish both annual and sustainability reports while others publish an annual report only. Among the selected shipping corporations, the Mediterranean Shipping Company neither publishes its annual reports, nor are its budgets verifiable. (Table 1).

The China Shipping Container Lines has an interesting practice; the company publishes its annual report in English, but its sustainability report in Chinese. CMA CGM Group has only one annual report available online. Hapag - Lloyd has all but their 2009 annual report online. Table 2 below is the summary of publishing practices by major shipping lines in the world.

Only 3 out of 10 shipping corporations publish a sustainability report, meaning that generally there is a poor level of reporting. Remarkably, the sustainability report produced by The China Shipping Container Lines is written only in Chinese Mandarin meaning that only Chinese speakers can understand the report and other stakeholders are left in the dark. This leaves only two companies, Maersk Line and COSCOL, which disclose sufficient sustainability related information for global stakeholders.

Table 1
Ranking of shipping lines by alphaliner.com.

Rank	Operator	TEU Capacity	Market Share
1	Maersk Line	2,921,125	15.50%
2	Mediterranean Shipping Company S.A.	2,550,147	13.60%
3	CMA CGM Group	1,628,269	8.70%
4	Hapag – Lloyd	965,168	5.10%
5	Evergreen Marine Corporation	948,220	5.00%
6	China Ocean Shipping Container Line	819,429	4.40%
7	The China Shipping Container Lines	656,050	3.50%
8	Hanjin Shipping Company	608,459	3.20%
9	Mitsui O.S.K. Lines	604,720	3.20%
10	The American President Lines	562,346	3.00%

Table 2
Shipping corporations with relevant reports online (✓= Yes, X=No).

Corporation	Annual Report	Sustainability Report	Period
Maersk Line	✓	✓	2009 – 2013
Mediterranean Shipping Company S.A.	X	X	
CMA CGM Group	✓	X	2013[a]
Hapag - Lloyd	✓	X	2010–2013
Evergreen Marine Corporation	✓	X	2009–2013
China Ocean Shipping Container Line	✓	✓	2009–2013[b]
The China Shipping Container Lines	✓	✓[c]	2009–2013
Hanjin Shipping Company	✓	X	2009–2013
Mitsui O.S.K. Lines	✓	X	2009–2013
The American President Lines	✓	X	2009–2013

[a] only the 2013 annual report is available online
[b] some of their sustainability reports cannot be accessed online. They also do not regularly publish sustainability reports
[c] all sustainability reports are in Chinese

4.3.2. Disclosure on CO_2 emissions is very poor

All eight shipping lines have annual reports available on their webpages for the period of 2009–2013 except Hapag – Lloyd which has annual reports for 2010 – 2013. In the first stage, with Nvivo, all annual reports have been analyzed to find out how many times they discuss 'carbon emission'. Results from this step were then manually checked against annual reports to find any repetition or out of context mentions. For example, if 'carbon emission' is mentioned in the table of contents, it is not calculated. A similar method was used regarding repetition to calculate the actual mentioning of the words in the annual reports.

The Evergreen Marine Corporation does not mention carbon or emission or carbon emission in their annual reports. Therefore, it has been excluded from further analysis. The results of analysis for the remaining seven companies are presented in Fig. 1.

The figure shows that overall reporting on carbon emission is very poor. Shipping corporations publish basic information on carbon emissions and they do not follow any predictable pattern, let alone a common pattern, for this information. Some corporations, for example, CSCL and Hanjin SC, ignore carbon emission issues in their annual reports quite visibly. CSCL did not discuss the carbon emission issue in its 2009 and 2010 annual reports while Hanjin SC ignored carbon emission issues in its 2011, 2012, and 2013 annual reports. Their discussion on carbon emission is

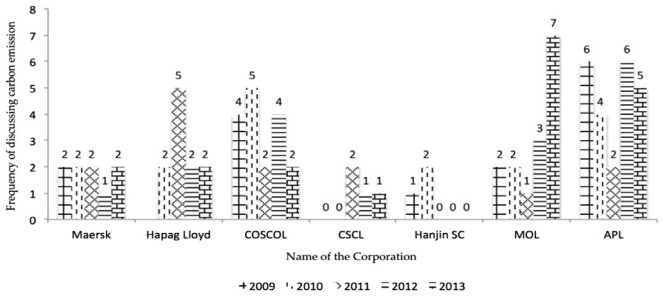

Fig. 1. Frequency of 'carbon emission' discussion during 2009–13.

extremely limited in other years as well.

In the second stage, in another manual check, the annual reports of seven corporations were examined to reveal how many pages (approximately) shipping corporations allocated to offer information about carbon emissions, sustainability, and other environmental concerns in 2013.

The approximate number of pages presenting the environmental concerns of shipping corporations was then compared with the total page numbers of the annual reports to discern the percentage of environmental issue coverage for the seven corporations. The maximum coverage, which is still poor at 4.46%, is found within reporting by Mitsui O.S.K. Lines. Environmental coverage and the frequency of carbon emission discussion in 2013 are presented in Fig. 2.

This study demonstrates that reporting on environmental issues by shipping corporations in their annual reports is very low. The top 10 shipping corporations do not place emphasis on environmental reporting. They report basic matters, but do not discuss the cost of CO_2 emissions, how much money they invest in technological development to minimize carbon emissions, their strategic plan to invest in an alternative to fossil fuels, and how their carbon emissions impact on their stakeholders. Some corporations express their concern for the environment in a limited way, but do not give further details on what actions they will take on issues such as carbon emissions.

The above analysis of the annual reports of the world's top eight shipping corporations suggests that: (a) the world's largest shipping corporations do not publish sufficient information in their accounts, (b) they publish very little on their carbon emissions, and (c) the amount of carbon emissions cannot be calculated from the data available in their annual reports. For instance, on their website, the Maersk Line claims that they have reduced CO_2 emissions by 3.8 million tonnes in 2013 and two-thirds of total CO_2 emissions from their vessels since 2007.[9] However, in their annual reports, this corporation rarely provides data on their CO_2 emissions reduction for a particular year, let alone disclosures by vessel. Therefore, due to the lack of categorized data in the yearly reports, it is almost impossible for a stakeholder to verify the

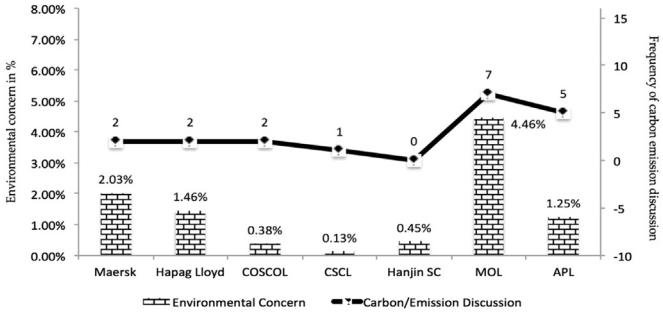

Fig. 2. Shipping corporations' concern about the environment and carbon emission in 2013.

above claim mentioned on its website and review the nature of carbon emissions at each company.

Also, in annual reports, there is not sufficient environmental information based on which stakeholders can perform an analysis, and further, hold corporations liable for their misdeeds, if any. Thus, as defined earlier, accountability cannot be discharged without appropriate information upon which reward and punishment can be realized. Accountability is therefore compromised regarding environmental reporting by these corporations. However, it is acknowledged that the publishing of a sustainability report alone does not necessarily mean the accomplishment of accountability [1,2,80].

Published accounts by shipping corporations on carbon emissions provide nothing more than a discussion on corporations' overall carbon strategy, what actions corporations have already taken and their plan to implement carbon reduction. These accounts merely signal recognition to the corporation for their carbon reduction activities. The reporting by shipping corporations is neither in a uniform format nor in a user-friendly format such as the Global Reporting Initiative (GRI).[10] They also know that with the increase in the publication of emissions statistics, regulators will introduce tougher sanctions that will make their businesses more expensive to run and reduce profit [107,114]. This might motivate them to hide or manipulate emissions data [12,51]. Hence, the information value to users of these reports remains limited and creates a gap between the perceived reporting and the performance expectation [1,22]. Also, it creates room for doubt 'as to whether reporting reflected performance…would not be tolerated in financial reporting'. In the absence of either legal regulation or market based regulation for this reporting practice, it is likely that such disclosures will continue to be incomplete, inconsistent and lack comparability [22].

5. Improving the accountability practices of shipping corporations for reducing vessel-sourced GHG emissions

In the regulation landscape, improving responsibility performances through effective corporate accountability practices is a comparatively new approach, in which different forms of regulations regulate one another. It is based on the precepts of New Governance, which encourage different actors and factors to work together within regulatory strategies designed to reach a public policy goal [93]. This approach attempts to link social values to economic incentives and disincentives, and it indirectly influences corporations to incorporate social responsibility principles through self-regulation [28,40]. It could help regulators create a more socially responsible corporate culture, as corporations would then be in a stronger position to persuade management to embrace the ethos of this notion in their core strategies. This section argues that holding shipping corporations accountable to their consumers for their roles and performances on air pollution and its reduction is a viable market based mechanism for the reduction of vessel-sourced GHG emissions. These corporations must be accountable for this by regularly disclosing information on their emissions reduction performance to their consumers and regulators. A global instrument or an inclusion of a duty to disclose this information in the national legislation of the states that own most of the leading shipping corporations could be an effective way to compel these corporations to make such disclosures.

Requiring reports on GHG emissions reduction performance is a comparatively new and popular MBM for improving corporate accountability. There could be various ways, other than the use of laws, to hold corporations accountable to stakeholders [17]. A code of conduct prepared by the industry, incentives from the government, and pressure from constituents can also make corporations

accountable to disclose the necessary information on their emissions reduction performances (the development of Monitoring, Reporting and Verification [MRV] system by the European Union as such a mechanism will be discussed below). Governments can also encourage corporations to make such disclosures by providing fast-tracking in the granting of permissions, scheduling inspections less frequently, offering tax breaks and by providing public recognition to reward businesses that demonstrate commitment to specific social values in their internal regulations [38]. To take advantage of these incentives, corporations would then develop suitable internal systems to demonstrate their social commitment. The application of such strategies through laws could encourage corporations to take systematic action to be competitive in the market and assist external stakeholders to reach their individual goals. For instance, a law that requires corporations to include information on their energy consumption into their annual reports could trigger a series of actions by both the corporation and its constituents. Essentially, this will enhance dialogue and reflexivity between corporations and stakeholders that will strengthen accountability and could lead to reductions in GHG emissions.

To become compliant by disclosing information on emissions reduction performances, corporations also need to have plans in place to reduce emissions from their vessels. Documented plans and results would assist audit or tax authorities to calculate a rebate or fine for each corporation as appropriate. This information could also be used by the media to expose corporations which are not improving their performance, again encouraging them to become more energy efficient.

There is legislation capable of holding corporations accountable for their performance on emissions reduction. For example, Australia passed the *National Greenhouse and Energy Reporting Act 2007* after the ratification of the Kyoto Protocol. Under this legislation, corporations are required to report GHG emissions, energy production and consumption and other information related to their performance on emissions reduction to the Greenhouse and Energy Reporting Office [22]. However, most of the states heavily involved in the global shipping business are not subject to legislation such as this. While there is a growing movement to impose this kind of disclosure responsibility on corporations in general in the developed economies, regulating the responsibilities of corporations for vessel-sourced emissions remains untouched.

One of the reasons for this could be the difficulty in establishing the relationship between the vessel and its actual owner [37]. A huge number of vessels operate under the flag of convenience and this allows the real owner of GHG emitting vessels to easily disguise their identity [6,97]. Another reason is that the states that provide registration to vessels, as separate legal entities, have no actual control over the registered vessels, which may seldom or never visit their territory [58].[11] Hence these states do not have any incentive for enforcing disclosure provisions on the vessels carrying their flags. It is worth mentioning here that the major shipping corporations do not heavily depend on the 'flag of convenience' strategy for their vessels' registration. Maersk Line, for instance, has 580 vessels and most of these are registered in Denmark – the home country of this corporation. A good number of vessels of this corporation are registered in some developed states like the USA, UK, Singapore, but almost none of their vessels are registered in Liberia or Panama or Vanuatu.

It seems that the current global regulatory framework for reducing vessel-sourced GHG emissions is based on the development of theories necessary for calculating the consumption of fuel by the vessels. It also relies on the estimation of emissions from fuel consumption data. The IMO started working in 1948 as a body of the United Nations and is entrusted with the development of regulations and standards pertaining to the safety and environmental impacts of international shipping. The institution has no enforcement power; the responsibility of enforcement of regulations and standards developed by the IMO rests with national authorities [10, p.62]; [34, p.454]. However, the IMO has been successful in improving standards of environmental protection [76]. The IMO made it compulsory for all vessels built after 1 January 2013 to comply with the Energy Efficiency Design Index (EEDI). The major purpose of this index is to encourage efficient energy use and allow for the calculation of carbon emission. EEDI allows vessels to achieve minimum level energy efficiency. It calculates the amount of carbon emissions from the design of the vessels and the data on the performance of the vessels' engines [94].

The EU, with a long term target to reduce carbon emissions by 40–50% of its 2005 level by 2050, adopted a regulation framework on monitoring, reporting, and verification (MRV) which became effective from July 1, 2015. Once this regulation is in effect, all large vessels entering ports within EU jurisdiction from January 2018 must have a verified emissions report.[12] This is expected to result in up to a 2% reduction in emissions compared to a business as usual situation, lead to significant cost savings for ship owners and enable detailed monitoring of individual ships' performance. Presently, an expert consultation process is underway to clarify assistance to help companies meet proposed regulations, define verification rules and set up an accreditation process. Despite the inroads made, the MEPC President noted the importance of the MRV scheme in the 68th session of the group. In particular, the Secretary General voiced reservations about differing monitoring standards and the implications that this may have for the integrity of the IMO as an international standard setting body [57]. Particularly, if international standards surpassed the IMO developed frameworks. Indeed, the IMO worked actively to outline key focus areas in order to "remain relevant and respond in an appropriate and timely manner" to the Paris Agreement which included the adoption of a global MRV system (MPEC, 26 February 2016). MPEC realizes the impetus to finalise its MRV standards quickly although debates remain strong about the level of detail and secrecy that some within the IMO are demanding (MPEC, 26 February 2016). Current EU MRV regulation excludes small emitters (vessels below 5000 gross tons) from its scope as it is only applicable to vessels above 5000 gross tons.[13] Vessels entering and leaving must have a verification certificate detailing their carbon emissions and a failure to carry this document more than once can result in an expulsion order for the ship [11]. Once in effect, the regulation is expected to produce an accurate reading of carbon emissions by vessels.

Regulations and standards formulated by the IMO and the EU may contribute to efforts to reduce carbon emissions, however the significance of these reductions is debated [14]. But this legal framework is not sufficient to ensure the total accountability of the parties responsible for this emission. Major issues in carbon related accountability of shipping corporations originate from the methods used to calculate the 'consumption of fuel'. The formula that is frequently used to calculate the amount of carbon emissions, *amount of carbon emission = amount of consumed fuel x emission factor,* clearly shows that one has to focus on the amount of fuel consumed rather than the emission factor which is fixed by the Intergovernmental Panel on Climate Change and which depends on the type of fuel used. Increase in the consumption of fuel will increase the amount of carbon emission and vice versa. Accordingly, to reduce carbon emissions, it is important to minimize the use of fuel by increasing efficiency in fuel consumption. If vessels are efficient in fuel consumption, the amount of CO_2 emission decreases. It means that there is a negative relationship between efficiency in fuel consumption and the amount of carbon emissions. Therefore, 'fuel consumption' is the focal point in both the reduction and calculation of carbon emissions. So, the very

first task in the controlling of carbon emissions or in the designing of a policy framework to control carbon emissions is the development of an accountability practice on the calculation of the amount of fuel that has been consumed.

The calculation of the amount of consumed fuel is very difficult at all stages and very often shipping corporations estimate the amount based on activity or output. The IMO, in their 2009 report, recognizes two methods of calculating fuel consumption: the activity based method and fuel statistics [54, p.24]. They opine that the first method represents a more accurate picture of fuel consumption, but it is not one hundred percent accurate. The method requires large volumes of data that are not available at a certain point in time [54, p.24]. In such a situation, someone may consider the use of a Bunker Delivery Note (BDN) as an effective tool for measuring fuel consumption by the vessels. It is like the common management accounting process: fuel at the beginning + delivery during the period - fuel at the end. The success with the formula depends on the accurate recording at each of the three stages: beginning, end, and delivery point. While proposing a new regulation on monitoring, reporting, and carbon emission verification following this implementation of this method in the European Union, it has been argued that there is no data to indicate the precise amount of CO_2 and other GHG emissions because of the lack of monitoring and reporting mechanisms [32, p.3].

This opens up the potential for problems in an emissions reduction regulatory framework. What happens if someone makes either intentional or unintentional errors in recording in any of the fuel consumption calculation stages? Misrepresentation at any stage will change the total calculation followed by inaccurate carbon emissions reporting. Such an action would jeopardize the success of the policies designed to mitigate the negative effects of pollution. Similar problems remain with the regulatory framework proposed by the EU. As per the regulation, shipping corporations design a monitoring plan, instruct their vessels to measure and record emissions, and submit the emissions report to the authority.[14] The submitted report is then verified by the third party verifier,[15] who is independent of the company and operator, by comparing the estimated emissions against the reported emissions. The estimation is produced based on the vessels' tracking data and characteristics. In the verification process, if any unexpected abnormality regarding carbon emissions is detected, shipping corporations are responsible for providing a proper explanation.

Developing accurate mechanical devices and technical equations are vital for measuring emissions of ships. They are an important part of the emissions reduction regulation framework. In particular, the EEDI and the SEEMP are potentially strong contributors to this framework. These procedures, however, came into force only on 1 January 2013 and it will be some years before their effectiveness can be evaluated [11,29]. Moreover, as discussed earlier, these procedures alone are not sufficient for effective reduction of vessel-sourced GHG emissions [102]. Recent initiatives as a result of the Paris Agreement have increased pressure on the international shipping industry to reach peak CO_2 emissions as early as possible before aiming for a complete elimination of emissions (IMO, 26 February 2016). As a consequence, the IMO and MPEC consider resolutions at the 69th session of MPEC will "be a litmus test of the IMO and its Member States' determination to play a meaningful role in the fight against climate change" (MPEC, 26 February 2016). This is due to the rapid growth of international seaborne trade and political disparities amongst the states. In this juncture, along with the current initiatives, the global framework for GHG emissions reduction regulation should be enhanced with some specific market based mechanisms (MBMs).

Recently, the international community has turned to MBMs to explore their effectiveness in the possible reduction of GHG emissions resulting from anthropogenic activities [69,103]. MBMs generally refer to the mechanisms based on the market principles and practices which economically bind a market actor to perform a certain act [42,43]. In the global shipping industry regulatory framework, these mechanisms are regarded as supplements to the technical and operational measures to reduce vessel-sourced GHG emissions [90]. The IMO is trying to promote the awareness of the creation and application of different MBMs for this industry. In 2009 it commissioned a study – the Scientific Study on International Shipping and Market-Based Instruments (Scientific Study) and established a group of experts to study the feasibility of this mechanism for this industry.

The MBMs currently under discussion can be divided into three groups: (a) environmental fees, (b) tradable permit schemes and (c) liability rules.[17] The core of these mechanisms is that they can assist regulators to make shipping corporations internalize the cost of GHG emissions from their vessels, without mandating any command and control type legal regulation. Reducing GHG emissions by improving global shipping corporations' accountability for their vessels' emissions reduction performances is a hybrid type of market based mechanism. Of the seven MBM proposals put forward by the IMO, the efficiency incentive scheme, ship efficiency and credit trading, and rebate mechanisms are also similar. It is not the aim of this paper to compare these mechanisms. Indeed, there is no single MBM that can provide solutions for different problems. In practice some issues might need a mix of two or three types of MBMs and there is no MBM without any problems [69]. The above three types of MBMs contain some fundamental flaws. The efficiency incentive scheme and ship efficiency and credit trading are based on the EEDI and this has made these mechanisms less attractive. As discussed earlier, a low EEDI may indicate high energy efficiency, but this does not mean that a vessel performed well in GHG emissions reduction. A vessel with a low EEDI may emit more GHG than a vessel with a larger engine (high EEDI), 'which it needs to maintain certain speed to ensure safety in the bad weather' [90,102].' Another difficulty with these MBMs is that they are meant for both new and old vessels, whereas the application of the EEDI is limited to new vessels.[19] These MBMs are not fully in operation and so far there has been no study conducted on the possible effects of these mechanisms in the international shipping industry. In these circumstances, it is an arduous task for the IMO to propose a definite decision on these MBMs, as the aim of this international organization is to 'encourage the removal of discriminatory actions and unnecessary restrictions by Governments affecting shipping engaged in international trade so as to promote the availability of shipping services to the commerce of the world without discrimination.'[20] Exactly how the IMO can balance their aims against proposals to help reduce carbon emissions remains to be seen. This point is particularly salient because of the strong targets to maintain global climate change below the 2 °C maximum limit discussed in the Paris Agreement. Current measures have been argued as inadequate with immediate reevaluation of the industry's response needed in order to achieve climate change targets [4,15].

Improving global shipping corporations' accountability, by compelling them to disclose information regarding their GHG emissions reduction performance is a market based mechanism, where the shipping corporations are almost bound to perform a certain act in a more efficient way than their competitors in the global shipping market. The global shipping market is highly competitive, and if a corporation is not careful, a loss of market value is likely. Consumers (and especially constituents) of these shipping corporations also have a role to play in indirectly insisting that business activities are carried out in a particular manner. Insisting that corporations disclose their GHG emissions reduction performance is one act that can encourage competition among

global shipping corporations. When corporations act with conscience and goodwill in the market, they will gain the trust of their constituents and consumers and secure greater market share. The costs of such disclosure practices can be offset by the benefits that can be earned from an extended share in the market. Increasing the levels of civil society pressure, incentives from government and greater constituent awareness can also compel shipping corporations to report on fuel type, fuel consumption and the technology used to reduce emissions from fuel consumption by their vessels. Once a corporation is consistently reporting in this area, competitors will be bound to do the same, and will strive to improve the reporting process. This new competition in better and more effective reporting would ultimately push corporations to invest more in actual GHG emissions reduction. This would also assist consumers, constituents and regulators to assess the worth of any given corporation and make good decisions about future business with them.

As such, the Conference of Parties to the UNFCCC and the IMO should consider strategies to improve the GHG emissions disclosure practices of global shipping corporations. Effective and adequate disclosure is a way to ensure accountability for a particular responsibility. High standards of accountability practices can also allow corporations to improve their ability to perform better in reducing GHG emissions from their vessels [77,90,95]. If necessary, the IMO can extend its work with the International Organization for Standardization to formulate a disclosure guideline on GHG emissions reduction performance for the international shipping industry [60].

6. Conclusion

The current regulatory framework that exists to assist shipping corporations to address issues related to the impact of their vessels' GHG emissions on global climate change is seen to be woefully inadequate. Within the global GHG emissions reduction framework, all the regulatory modes are predominantly state centric. Unfortunately, different states are not cohesive; they have failed to prepare any comprehensive mechanism through which shipping corporations are effectively included in the framework.

Conventions such as United Nations Convention on the Law of the Sea (UNCLOS) Article 207, 211, and 212 (discussed on page 7) provided the rule which gives responsibility for vessel-sourced GHG emissions reduction to the developed states. However, out of the top 10 global shipping corporations, seven are owned either by the developed states or the citizens of these states. Arguably, so far these states have managed to avoid the worst impacts of GHG emissions on the environment compared to developing countries in Asia and the Pacific. Hence, it seems that they are reluctant to impose any international instrument on global shipping corporations' roles in vessel-sourced emissions reduction. This is further evidenced by the debates taking place at International Maritime Organization about the necessity to disclose detailed data of ship emissions based on 'real' data and not proxies, and the sensitivity of increased transparency.

Improving the environmental accountability of global shipping corporations can contribute to the reduction of vessel-sourced GHG emissions. Accountability practice recognizes that the motivation, standards and even monitoring and enforcement systems for responsibility do not depend only on international instruments. Rather, accountability practice assists corporations to design their own compliance management systems according to their specific circumstances in the market. Shipping corporations can then present their performance standards in their disclosure documents. Industry codes of conduct, private standards, competition and incentives can strongly motivate corporations to effectively report on their social and environmental impacts and ethical performance. To fulfill reporting requirements, the management team of ships can be encouraged to create internal policies regarding emissions reduction and collection of information. Corporate management may then use this information to adopt strategies for managing any risks identified during the emissions reduction and information collection process. This is essential for corporations that are required to report on their vessels' emissions reduction performances. Their reports would also enable business constituents and consumers to exert pressure on corporations to perform better than their competitors and reduce emissions even further.

Due to the complexities of shipping trade and the difficulties involved in regulating this business, a comprehensive and generally acceptable regulatory framework on corporate responsibility for reducing GHG emissions is unlikely to be achieved soon. In fact, emissions are continuing to increase. Under these circumstances, it is necessary for the states, the shipping industry and global organizations to explore and discuss MBMs for vessel-sourced GHG emissions reduction. There is no point waiting for the development of a comprehensive international instrument; current measures are not encouraging change quickly enough.

Notes.

1. Decision 1/CP.16 of the Conference of Parties on its sixteenth session, held in Cancun (from 29 November to 10 December 2010) to the UNFCCC.
2. Some of these instruments are as follows: International Convention on Oil Pollution Preparedness, Response and Co-operation, 30 November 1990, 30 I.L.M. 733 (entered into force 13 May 1995) and its Protocol on Preparedness, Response and Co-operation to Pollution Incidents by Hazardous and Noxious Substances, 15 March 2000, [2003] ATNIF 9 (entered into force 14 June 2007); International Convention on Civil Liability for Oil pollution Damage, 27 November 1992, 1953 U.N.T.S. 255 (entered into force 30 May 1996); International Convention on the Establishment of an International Fund for the Compensation for Oil Pollution Damage, 27 November 1992, 1953 U.N.T. S 330 (entered into force 30 May 1996); International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea (HNS), 3 May 1996, 35 I.L.M. 1406 (not yet entered into force) [HNS]; International Convention on Liability and Compensation for Bunker Oil Spills, 23 March 2001, U.K.T.S. (No. 8) 2005 (entered into force 21 November 2008); International Convention on the Control of Harmful Anti-Fouling Systems on Vessels, 5 October 2001, IMO Doc. AFS/CONF/26 (entered into force 17 September 2008); International Convention for the Control and Management of Ship's Ballast Water and Sediments, 13 February 2004, [2005] ATNIF 18 (not yet entered into force); Nairobi International Convention on the Removal of Wrecks, 18 May 2007, IMO Doc. LEG/CONF.16/19 (will come into effect in April 2015).
3. These options were as follows. (a) No allocation of bunker fuel; (b) allocation to the country where bunker fuel is sold; (c) allocation to the country of the transporting company; the country of registration of the vessel, or the country of the operator; (d) allocation to the country of departure of destination of the vessel (including sharing emission between them); (e) allocation to the country of departure or destination of the passenger/cargo (including sharing emission).
4. From an exploratory study of three leading maritime law related journals, evidence suggests only 13 of 1191 articles discuss accountability of shipping corporations or closely related topics. The *Lloyd's Maritime and Commercial Law Quarterly* published 208 articles during the 2004–2014 periods, but none

of them address accountability. The *World Maritime University Journal of Maritime Affairs* published 83 articles during 2010–2014 and had no articles on accountability. The *Marine Policy* published 900 articles during the 2010–2014 period and only 13 of those address either accountability or issues related to shipping corporations.

5. *Proceedings of the National Academy of Sciences of the United States of America* 106, no. 49 (2009): 20,616-20621.
6. For an idea on these accidents, in and around EU water during 2008, 754 vessels were involved in 670 accidents (sinking, collisions, groundings, fires/explosions and other significant accidents). The reasons for the accidents involving marine vessels are many. From a vessel perspective, of particular important reasons include the vessel age, vessel type, area of operation and challenging sea states and vessel size. From an administration perspective, the most important reasons include the poor performance of the shipping corporations and administrative complexities within the port and flag states are also responsible for these accidents. Some economic factors are also responsible for these accidents and shipping corporations are directly related to these reasons, these are the turn-around times and use of the minimum number of crew required to handle a vessel. For details, see [18], available at http://awsassets.panda. org/downloads /15_years_of shipping_accidents_a_review_for_wwf_.pdf at 19 May 2015
7. Directive 2012/33/EU.
8. Revised Annex VI adopted October 2008: MEPC. 176(58) Amendments to the Annex of the Protocol of 1997 to amend the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (Revised MARPOL Annex VI). Also should note that, although the 3.5% limit on Sulphur emissions came into effect on 1 Jan 2012, the revised Annex VI provides that this should be reduced progressively to 0.50%, effective from 1 January 2020, subject to a feasibility review to be completed no later than 2018.
9. For details, visit http://www.maerskline.com/en-au/about/facts-figures at 29 January 2015.
10. The Global Reporting Initiative (GRI) is a leading organization in the sustainability reporting field. It assists the corporations using sustainability reporting as a way to become more sustainable and contribute to the society. It has developed a comprehensive Sustainability Reporting Framework that is widely used around the world. For more on GRI, visit https://www.globalreporting.org/information/about-gri/what-is-GRI/Pages/ default.aspx at 23 February 2015.
11. Liberia is the home of 11% of the entire worlds' marine vessels. Now Panama is the largest registrant of vessels. As of 2012, this state provides registration to 6413 vessels of which 5162 are foreign owned and Japan is the largest client state with 2372 registrations. For a comprehensive list, visit http://basementgeographer.com/flags-of-convenience/ at 29 January 2015.
12. For details, visit http://ec.europa.eu/clima/policies/transport/shipping/index_en.htm
13. Chapter 1, Article 2, Regulation of the European parliament and of the council on the monitoring, reporting and verification of carbon dioxide emissions from maritime transport.
14. Chapter 2, Section, 1, Article 4, Regulation of the European Parliament and of the Council on the Monitoring, Reporting and Verification of Carbon Dioxide Emissions from Maritime Transport.
15. Chapter 2, Section, 1, Article 4, Regulation of the European Parliament and of the Council on the Monitoring, Reporting and Verification of Carbon Dioxide Emissions from Maritime Transport.
16. For details, see IMO Environment Committee Makes Progress, available at http://www.imo.org/blast/mainframe.asp?Topic_id=1859&doc_id=12724 at 30 January 2015. *Uncertainties and Problems in Market-based Measures*, submitted by China and India, MEPC 61st Session, Agenda Item 5, Doc MEPC 61/5/24 (5 August 2010); *Market-based Measures: Inequitable Burden on Developing Countries*, submitted by India, MEPC 61st Session, Agenda Item 5, Doc MEPC 61/5/19 (2 August 2010).
17. For details, see *Scientific Study on International Shipping and Market-based Instruments*, MEPC 60th Session, Agenda Item 4, Doc MEPC 60/INF.21 (15 January 2010) at 14, Annex.
18. For an idea regarding these focuses, see *Market-based Measures: Inequitable Burden on Developing Countries*, submitted by India, MEPC 61st Session, Agenda Item 5, Doc MEPC 61/5/19 (2 August 2010) at 3. *Possible Incompatibility between the WTO Rules and Market-based Measures for International Shipping*, submitted by India and Saudi Arabia, MEPC 64th Session, Agenda Item 5, Doc MEPC 64/5/3 (29 June 2012).
19. MARPOL Convention, Annex VI (2011), Regulation 20–21. *Application of the EEDI to Existing Ships*, submitted by the International Association of Dry Cargo Ship Owners, MEPC 63rd Session, Agenda Item 5, Doc MEPC 63/5/12 (6 January 2012), summary.
20. Convention on the International Maritime Organization, 289 UNTS 48, 6 March 1948, Art.1 (b).

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