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# Reducing greenhouse gas emissions from international shipping: Is it time to consider market-based measures?



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## ABSTRACT

International shipping carries around 80 per cent of global trade by volume and over 70 per cent by value. However, there is concern that the greenhouse gas (GHG) emissions from international shipping lead to adverse effects on climate, human health and marine ecosystems. Currently the international climate change regime under the *United Nations Framework Convention on Climate Change (UNFCCC)* process and the IMO through its Marine Environment Protection Committee are grappling with this issue, and GHG emissions from international shipping have been partially regulated by amendments to Annex VI to the *International Convention for the Prevention of Pollution from Ships (MARPOL 73/78)* in 2011 and 2014. These amendments aim to reduce GHG emissions from international shipping by means of technical and operational measures. However, research indicates that the adopted technical and operational measures alone would not achieve absolute emissions reduction due to projected growth of international seaborne trade. Currently it is still controversial whether it is time to consider market-based measures (MBMs) in furthering the reduction of shipping GHG emissions. This article examines whether it is necessary to adopt MBMs, proposes a preferred MBM, and suggests that a MBM be considered in or after 2016.

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## 1. Introduction

Climate change has been discussed broadly around the world and has been regarded as a factor contributing to all global issues [1]. Greenhouse gas (GHG) emissions constitute the largest contribution to climate change [2], and have thus attracted mounting attention from the international community as to how to effectively reduce GHG emissions on a global scale. Seven types of GHGs are listed under the 2011 amendments to the *Kyoto Protocol* [3], to the *United Nations Framework Convention on Climate Change (UNFCCC)* [4]. They are CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, SF<sub>6</sub> and NF<sub>3</sub> [5]. International shipping carries around 80 per cent of global trade by volume and over 70 per cent by value [6]. However, in 2007, CO<sub>2</sub> emissions from international shipping reached 870 million tonnes, which accounted for 2.7 per cent of the global emissions of CO<sub>2</sub> [7]. Although in 2012 this figure decreased to 2.2 per cent as a result of global economic crisis, it is projected that CO<sub>2</sub> emissions from shipping will continue to grow by 50 per cent to 250 per cent in the period to 2050 due to projected growth in demand for maritime transport services [8]. Achieving an increase of no more than two degrees Celsius in the global average temperature by 2100 has become the goal of the international community in

tackling climate change [9]. Furthermore, research indicates that compared with 1990, an approximately 50:50 chance of avoiding two degrees demands a 70–80 per cent reduction in emissions from energy by 2050 [10]. Accordingly the scale of reduction from shipping GHG emissions to meet the two degrees target is unprecedented, and it is significant to expedite the global regulation of this issue.

International shipping has been defined by the International Maritime Organization (IMO) as ‘shipping between ports of different countries, as opposed to *domestic shipping* [11]’, and excludes military and fishing vessels engaged on such voyages. Consistent with the *2006 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC 2006 Guidelines)* [12], this definition also indicates that the same ship under an international voyage may frequently be engaged in both international and domestic shipping operations [13]. Indeed, this feature of international shipping constitutes the main barrier to including GHG emissions from international shipping in the State-based *Kyoto Protocol* to the UNFCCC. This is because it is difficult to allocate GHG emissions from international shipping to different States as a ship emits all the time when it navigates. The UNFCCC’s Subsidiary Body on Scientific and Technological Advice (SBSTA) worked on this emission-allocation issue from 1995 to 1996, but failed to reach consensus among different States [14]. In addition to differing regulatory interests of States, technical barriers in gathering detailed,

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accurate and annual GHG emissions data sufficient to support this apportionment regime might also contribute to this failure [15]. The subsequent Ad Hoc Working Group on Long-term Cooperative Action (AWG-LCA) under the UNFCCC started to work on international bunker fuels based on the *Bali Action Plan* in 2008 [16]. It worked on regulatory principles, the setting of reduction targets and the IMO's competence. However, no substantial outcome had been achieved before the AWG-LCA terminated its work at the Doha Climate Change Conference in 2012.

Currently the IMO is the main international organisation working on the regulation of GHG emissions from international shipping. While Article 2(2) of the *Kyoto Protocol* delegates the IMO to regulate this GHG issue, it is also arguable that the *Convention on the International Maritime Organization* [17], and the *United Nations Convention on the Law of the Sea (UNCLOS)* [18], provide the IMO with the competence to regulate GHG emissions from ships [19]. The IMO has utilised these competences to regulate this GHG emissions issue within its Marine Environment Protection Committee (MEPC). The most significant achievement is the adopted technical and operational measures in the form of amendments to Annex VI to the *International Convention for the Prevention of Pollution from Ships (MARPOL 73/78)* in 2011 and 2014 [20]. To date three categories of measures have been discussed within the IMO to tackle GHG emissions from ships: technical measures, operational measures and market-based measures (MBMs) [21]. It is still very controversial whether MBMs should be adopted to further the reduction of GHG emissions from international shipping. For example, many States and shipping organisations welcome MBMs, whereas large developing States, India as an example, oppose the possible adoption of any MBMs by the IMO because it is feared that they would jeopardise the interests of their shipping industry [22]. This article first introduces the recent developments in regulating this GHG issue within the IMO. Then it examines whether a MBM should be adopted and how to select the most suitable MBM for furthering the reduction of GHG emissions from international shipping.

## 2. Recent developments in regulating greenhouse gas emissions from international shipping

The ultimate objective of the UNFCCC is to avoid dangerous anthropogenic interference of GHG concentrations in the atmosphere with the climate system [23]. This objective has been translated into the two degrees goal incorporated in the 2009 Copenhagen Accord and the 2010 Cancun Agreement. While GHG emissions from international shipping stay unregulated by the Kyoto Protocol and are subject to the regulation by the IMO, it is imperative for the IMO to regulate this GHG issue and reconcile shipping emissions with this two degrees goal.

The IMO started its work on regulating GHG emissions from international shipping in 1997 [24]. In that year, the MARPOL Conference adopted Resolution 8 on 'CO<sub>2</sub> emissions from ships', which requested the IMO to undertake a study on GHG emissions from ships and consider feasible CO<sub>2</sub> reduction strategies [25]. In 2003, the IMO Assembly adopted a resolution on 'IMO policies and practices related to the reduction of greenhouse gas emissions from ships', urging the MEPC to 'identify and develop the mechanism or mechanisms needed to achieve the limitation or reduction of GHG emissions from international shipping [26]'. Since then, the IMO has been working on this issue by means of negotiations and discussions within its MEPC. This work consists of three routes, namely technical measures, operational measures and MBMs.

At the 62nd MEPC meeting in 2011, the IMO adopted amendments to Annex VI to *MARPOL 73/78* which is regarded as the first

global and legally binding regulation on the reduction of GHG emissions from ships [27]. By adding a new Chapter 4 to Annex VI on the regulation of energy efficiency for ships, the amendments make mandatory the energy efficiency design index (EEDI) for new ships and the Ship Energy Efficiency Management Plan (SEEMP) for all ships. The EEDI, as the main technical measure, provides a specific figure representing a minimum energy efficiency level for certain ship types and size segments, expressed in grams of CO<sub>2</sub> per ship's capacity-mile. In other words, it provides a technological threshold for ships to meet the energy efficiency requirements. It is compulsory for certain types of new ships, but ship designers and shipbuilders are free to choose the most cost-efficient solutions for the ship to meet the regulations.

The SEEMP is the operational measure regulated by the 2011 amendments to Annex VI. It is the other component of the energy efficiency measures besides the EEDI, and it provides a flexible mechanism for shipowners and ship operators to monitor ship and fleet efficiency performance over time in a cost-effective manner [28]. The main purpose of this scheme is to minimise shipping GHG emissions through reducing fuel consumption [29]. The Energy Efficiency Operational Indicator (EEOI) is often utilised as a monitoring tool and to establish benchmarks related to energy efficiency of ships on a voluntary basis.

At the 66th MEPC meeting in April 2014, amendments to Annex VI to *MARPOL 73/78* were adopted to extend the application scope of the EEDI to include an extra five types of ships. They are Liquefied Natural Gas (LNG) carriers, roll-on/roll-off (ro-ro) cargo ships (vehicle carriers), ro-ro cargo ships, ro-ro passenger ships, and cruise passenger ships having non-conventional propulsion [30]. However, this extended application scope of the EEDI still does not include all types of new ships. In particular, the 2014 amendments to Annex VI exempts ships not propelled by mechanical means, platforms including Floating Production Storage and Offloading Facilities (FPSOs) and Floating Storage Units (FSUs) and drilling rigs, regardless of their forms of propulsion, as well as cargo ships having an ice-breaking capability [31]. Passenger ships other than cruise passenger ships will also remain unregulated by the EEDI.

In contrast to the technical and operational measures, MBMs have been extensively discussed and debated within the MEPC since they were formally put forward in the *First IMO GHG Study* in 2000 [32]. As of May 2013, seven types of MBMs have been submitted to the IMO. However, no consensus has been achieved among different States and the IMO decided to suspend the discussion on MBMs at the 65th MEPC meeting in 2013.

Currently the discussion on a global data collection system for CO<sub>2</sub> emissions from shipping has been held within the IMO. It is projected that the introduction of this system will lead to emissions reduction and to energy savings [33]. The IMO has obtained general support from its member States to develop and adopt this data collection system [34]. However, it was agreed at the IMO in May 2015 that the development of this system for ships should employ a three-step approach (data collection, data analysis and decision making), and it is premature to decide whether this system should be voluntary or mandatory [35]. It appears that the regulatory process on the data collection system within the IMO will not be fast.

Indeed this initiative was a response of the IMO to the unilateral action of the European Union (EU). In June 2013 the European Commission developed a proposal for an EU Regulation on Monitoring, Reporting and Verification (MRV) and submitted it to the European Parliament and the Council. This system may serve as the first step, while the ultimate goal is to reach a global agreement that may be achieved under the auspices of the IMO [36]. Due to the slow progress of the IMO in adopting a similar data collection system for ships, the EU MRV Regulation 2015/757

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