
Centre for International
Governance Innovation

Shipping and Climate Change

International Law and Policy Considerations

SPECIAL REPORT

Aldo Chircop, Meinhard Doelle and Ryan Gauvin



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This report reflects the findings and personal views of the authors and does not purport to represent the views of CIGI or any other organization or individual.



ACRONYMS AND ABBREVIATIONS

BWM Convention	International Convention for the Control and Management of Ships' Ballast Water and Sediments	GATS	General Agreement on Trade in Services
CBDR	common but differentiated responsibilities (also used in this report as an umbrella term for variations of the concept, including CBDR-RC and CBDR-RCNC)	GATT	General Agreement on Tariffs and Trade
CBDR-RC	common but differentiated responsibilities and respective capabilities	GHG	greenhouse gas
CBDR-RCNC	common but differentiated responsibilities and respective capabilities in the light of the different national circumstances	GloMEEP	Global Maritime Energy Efficiency Partnerships
CDM	Clean Development Mechanism	GT	gross tonnage
CFCs	chlorofluorocarbons	IACS	International Association of Classification Societies
CO₂	carbon dioxide	ICAO	International Civil Aviation Organization
COP	Conference of the Parties	III Code	IMO Instruments Implementation Code
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation	IMO	International Maritime Organization
ECAs	emissions control areas	IPCC	Intergovernmental Panel on Climate Change
EEDI	Energy Efficiency Design Index	IPTA	International Parcel Tankers Association
EEOI	Energy Efficiency Operational Indicator	ISM Code	International Management Code for the Safe Operation of Ships and for Pollution Prevention
EIS	Efficiency Incentive Scheme	ISWG-GHG	Intersessional Working Group on Reduction of GHG Emissions from Ships
ETS	emissions trading scheme	ISO	International Standards Organization
		IUCN	International Union for Conservation of Nature

LDCs	least-developed countries	SEEMP	Ship Energy Efficiency Management Plan
LLDCs	landlocked developing countries	SIDS	small island developing states
LNG	liquefied natural gas	SOx	sulphur oxides
LOSC	United Nations Convention on the Law of the Sea	SOLAS	International Convention on the Safety of Life at Sea
MARPOL	International Convention for the Prevention of Pollution from Ships	TBT	Agreement on Technical Barriers to Trade
MBMs	market-based mechanisms	UNCTAD	United Nations Conference on Trade and Development
MEAs	multilateral environmental agreements	UNFCCC	United Nations Framework Convention on Climate Change
MEPC	Marine Environment Protection Committee	WSC	World Shipping Council
MFN	most favoured nation	WTO	World Trade Organization
MoU	memorandum of understanding	WWF	World Wide Fund for Nature
MRV	monitoring, reporting and verification		
MSC	Maritime Safety Committee		
NDCs	nationally determined contributions		
NGOs	non-governmental organizations		
NMFT	no more favourable treatment principle		
NOx	nitrogen oxides		
PSC	port state control		
R&D	research and development		
RTKs	revenue per tonne-kilometres		
SBSTA	Subsidiary Body for Scientific and Technological Advice		
SDGs	UN Sustainable Development Goals		
SECT	Ship Efficiency and Credit Trading		





EXECUTIVE SUMMARY

This report investigates the international law and policy challenges to the determination of the international shipping industry's contribution to climate change mitigation efforts through the International Maritime Organization (IMO), a specialized agency of the United Nations and the competent international organization with respect to shipping in international law. The report sets out the international legal framework that serves as the context for the IMO initial strategy, the challenge of regulating greenhouse gas (GHG) emissions from international shipping, and the process and issues in determining the industry's "fair share" of mitigation efforts and potential legal pathways. The report concludes with general, policy and legal considerations that have a bearing on the current and possible future directions of the nascent IMO strategy and potential legal pathways.

General considerations include the observation that the complexity and uncertainty underscoring the development of the IMO strategy call for a long-term planning instrument that is integrated and systemic in scope, flexible in approach and adaptive in application. As other regimes and sectors progress in developing and delivering on mitigation efforts, care should be exercised in considering lessons and tools from other sectors for application to shipping, given its uniqueness and that other sector experiences emanate from different contexts and considerations. Given continuing significant differences on GHG issues in the IMO, it is vital for the long-term IMO strategy to be advanced and maintained on the basis of the culture of consensus that has helped shape the IMO as a successful regulatory body.

The policy considerations explored include the overall long-term goal, key milestones toward the goal, measures and timelines to achieving the goal, and reporting and review. A critical starting point will be the determination of the industry's fair contribution to the goals of the Paris Agreement and the overall climate mitigation effort expected from the sector. Key milestones include the peak year, the rate of emissions reduction after emissions have peaked, and a timeline for full decarbonization, explored in the context of short-, medium- and long-term targets and a combination of measures that work together effectively toward the long-term goal and interim targets. Technical and operational regulations, market-based mechanisms (MBMs), and mechanisms to review and adjust both the targets and role of the measures to achieve them are among the potential tools considered. A key consideration is the opportunity to synchronize the efforts of the IMO with commitments, review cycles, mechanisms and institutions under the Paris Agreement.

Legal considerations are underscored by the global nature of maritime regulation, the necessity to anticipate the steps needed to secure universal acceptance and uniform application of the measures adopted in or under the IMO strategy, and the relationship with other global and regional regimes. The potential relationship to other treaty regimes needs to be studied. It is likely that traditional maritime regulation alone will not be sufficient for the mitigation effort and that novel

measures and possible linkages with other global and regional regimes may be needed. While the International Convention for the Prevention of Pollution from Ships (MARPOL), as the leading IMO instrument on prevention of marine pollution, can be expected to continue to play a major role, the future introduction of an MBM will require careful consideration in maritime regulation. Future IMO regulation of GHG emissions is likely to be challenged to be consistent and coherent with the current industry regulatory system. While maritime regulation has well-developed principles and procedures, it will be important to harmonize mitigation regulation with other maritime regulatory concerns. Further considerations include whether states should be encouraged to extend international rules and standards to domestic shipping to facilitate GHG regulatory consistency across all forms of shipping. Finally, the finalized IMO strategy will need to give thought to how it will facilitate compliance with its spirit and letter.





INTRODUCTION

The purpose of this report is to investigate the international law and policy challenges in determining the international shipping industry's contribution to the reduction of greenhouse gas (GHG) emissions through the efforts of the International Maritime Organization (IMO), and to identify issues and possible legal pathways to address these challenges.

In its seminal resolution adopting the 2030 Agenda for Sustainable Development in 2015, the United Nations General Assembly underscored the need for “urgent action on climate change, so that it can support the needs of the present and future generations.”¹ In recognizing climate change as one of the greatest challenges of our times, the resolution recognized the wide range of impacts and that many least-developed countries (LDCs) and small island developing states (SIDS) will be seriously affected.² It called for “the widest possible international cooperation aimed at accelerating the reduction of global greenhouse gas emissions.”³ There is a commitment to adopt policies to promote sustainable transport systems.⁴ Several goals address the global climate change response directly or indirectly.⁵ The expectation is for a planetary response under the United Nations Framework Convention on Climate Change (UNFCCC)⁶ as the primary international and intergovernmental forum for negotiating the global response to climate change.⁷

The legal context of this report is the scope, functions and interactions of a number of major global regimes, namely and primarily: the Paris Agreement,⁸ pursuant to the UNFCCC with respect to the global efforts

1 *Transforming Our World: The 2030 Agenda for Sustainable Development*, GA Res 70/1, UNGAOR, 70th Sess, UN Doc A/RES/70/1 (2015), Preamble [SDG].

2 *Ibid* at para 14.

3 *Ibid* at para 31.

4 *Ibid* at para 27.

5 For example, Goal 7 aims at ensuring access to affordable, reliable, sustainable and modern energy for all and, among other goals, calls for doubling the global rate of improvement of energy efficiency and enhancement of international cooperation to facilitate access to clean energy research and technology by 2030. Also relevant are Goal 12 to ensure sustainable consumption and production patterns and Goal 13 to take urgent action to combat climate change and its impacts. *Ibid*.

6 *United Nations Framework Convention on Climate Change*, 9 May 1992, 1771 UNTS 107, 31 ILM 849 (entered into force 21 March 1994) [UNFCCC]. The UNFCCC and the Paris Agreement are referred to collectively in this report as the UN climate regime. Article 4.1(c) of the UNFCCC requires parties to promote and cooperate in the development, application and diffusion of technologies, practices and processes that reduce or prevent GHG emissions from the transport sector.

7 In addition to the UNFCCC, the SDGs expressly recognize this primary role. *SDG*, *supra* note 1 at para 31.

8 *Adoption of the Paris Agreement*, 12 December 2015, Dec CP.21, 21st Sess, UN Doc FCCC/CP/2015/L.9/Rev.1 (entered into force 4 November 2016) [Paris Agreement].

to address climate change generally; the United Nations Convention on the Law of the Sea (LOSC),⁹ with respect to atmospheric emissions from ships resulting in pollution of the marine environment; the IMO system of global maritime regulation and, most especially, the International Convention for the Prevention of Pollution from Ships, 1973/78 (MARPOL),¹⁰ with respect to the regulation of air emissions from ships on international voyages. To a lesser extent, the framework instruments of the World Trade Organization (WTO)¹¹ and the EU policy and regulation concerning monitoring, reporting and verification of carbon dioxide (CO₂) emissions from maritime transport are also set out as part of the larger context.¹² While international shipping emissions are not included in any of the current individual state party commitments under the Paris Agreement, they could be included in the future at the discretion of individual parties, and are captured under the collective goals and the global stocktake. The international expectation is that the IMO will facilitate the determination of the shipping industry's fair contribution consistently with the spirit of the Paris Agreement.

Of special and central significance for this report is the interaction of the Paris Agreement and IMO regimes. The Paris Agreement provides the framework for the adoption of national contributions determined at the national level,¹³ establishes the collective goals and takes stock of progress toward the collective goals through five-year review cycles.¹⁴ The expectation of the IMO is that the shipping industry's contribution will be determined at the intergovernmental organization level because the industry is globalized and transnational. The two regimes are guided by

different principles that shape how the respective contributions will be made, particularly “common but differentiated responsibilities and respective capabilities” (CBDR-RC) under the UNFCCC and with the addition of “in the light of the different national circumstances” (CBDR-RCNC) in the Paris Agreement on the one hand,¹⁵ and “no more favourable treatment” (NMFT) under the IMO conventions¹⁶ and related enforcement arrangements on the other hand.¹⁷

The IMO has been working on GHG emissions from ships for well over a decade. International shipping was the first industry to actually adopt measures with respect to such emissions at a global sectoral level, consisting mainly of technical (energy efficiency), operational (vessel management) and more recently fuel-related measures. At this time, it is unclear whether technical and operational measures, although essential, may be insufficient on their own to enable the industry to achieve the long-term goal of decarbonization and hence parallel discussions on MBMs have been conducted. In 2014, the divisions and controversies over the discussion on MBMs prompted suspension from further formal discussion by the IMO's Marine Environment Protection Committee (MEPC),¹⁸ although the topic was considered again by the first two meetings of the Intersessional Working Group on Reduction of GHG Emissions from Ships (ISWG-GHG) in June and October 2017 for possible inclusion in the comprehensive IMO strategy on reduction of GHG emissions from ships, referred to in this report as the IMO Strategy.¹⁹ The Initial IMO Strategy on Reduction of GHG Emissions from Ships, representing the path for the industry's share and its delivery, was adopted by MEPC 72

9 United Nations Convention on the Law of the Sea, 10 December 1982, 1833 UNTS 397, 21 ILM 1261 (entered into force 16 November 1994) [LOSC].

10 International Convention for the Prevention of Pollution from Ships, 2 November 1973, 1340 UNTS 184, 12 ILM 1319, as amended by the Protocol of 1978 Relating to the International Convention for the Prevention of Pollution from Ships, 17 February 1978, 1340 UNTS 61, 17 ILM 546 (entered into force 2 October 1983) [MARPOL].

11 Marrakesh Agreement Establishing the World Trade Organization, 15 April 1994, 1867 UNTS 154, 33 ILM 1144 (entered into force 1 January 1995); Agreement on Technical Barriers to Trade, 15 April 1994, 1868 UNTS 120 (entered into force 1 January 1995) [TBT]; General Agreement on Trade in Services, 15 April 1994, 1869 UNTS 183, 33 ILM 1167 (entered into force 1 January 1995) [GATS].

12 EC, Commission, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Integrating maritime transport emissions in the EU's greenhouse gas reduction policies, COM (2013) 479 final (28 June 2013); EC, Regulation (EU) 2015/757 of the European Parliament and of the Council of 29 April 2015 on the monitoring, reporting and verification of carbon dioxide emissions from maritime transport, and amending Directive 2009/16/EC, [2015] OJ, L 123/55.

13 Paris Agreement, *supra* note 8, arts 4, 7, 9, 10, 11, 13.

14 *Ibid.*, art 14.2.

15 *Ibid.*, art 2.2. The principle is discussed in more detail below in this report. See also Yubing Shi, *Climate Change and International Shipping: The Regulatory Framework for the Reduction of Greenhouse Gas Emissions* (Leiden, Boston: Brill Nijhoff, 2017) at 81.

16 See e.g. MARPOL, *supra* note 10, art 5(4).

17 NMFT is the basis of regional arrangements for port state control, i.e.: Europe and the North Atlantic (Paris MoU); Asia and the Pacific (Tokyo MoU); Latin America (Acuerdo de Viña del Mar); Caribbean (Caribbean MoU); West and Central Africa (Abuja MoU); the Black Sea region (Black Sea MoU); the Mediterranean (Mediterranean MoU); the Indian Ocean (Indian Ocean MoU) and the Persian Gulf (Riyadh MoU). For links to each MoU, see IMO, “Port State Control” (2017), online: IMO <www.imo.org>. See also Shi, *supra* note 15 at 91.

18 Report of the MEPC on its 65th Session, IMO Doc 65/22 (24 May 2013) at 44 [MEPC 65 Report].

19 Report of the First Meeting of the Intersessional Working Group on Reduction of GHG Emissions from Ships (ISWG-GHG 1), IMO Doc MEPC 71/WP.5 (30 June 2017) [ISWG-GHG 1 Report]; Report of the Second Meeting of the Intersessional Working Group on Reduction of GHG Emissions from Ships (ISWG-GHG 2), Note by the Secretariat, IMO Doc MEPC 72/7 (3 November 2017) [ISWG-GHG 2 Report].

in April 2018 and will be revised and adopted in 2023, in accordance with an agreed road map.²⁰

This report's ultimate focus on the legal aspects of the expected contribution of the international shipping industry necessitates comparative consideration of initiatives at other levels. First, the experience in the determination of contributions of other industries, most especially civil aviation as another globalized industry, may be informative. The parallel regime of the International Civil Aviation Organization (ICAO) provides an opportunity to understand analogous opportunities and constraints in determining the international shipping industry's contribution. Second, the European Union's efforts to regulate GHG emissions at the regional level have pressured the IMO to produce an effective strategy, failing which there is the very real prospect of an EU approach to reduce European-related shipping emissions.²¹ Third, the prospect that the UN climate regime will conclude, through its global stocktake exercise, that the international shipping sector is not making an adequate contribution to the global effort, potentially warranting parties to the UNFCCC and the Paris Agreement to engage more actively on this issue, provides important context for the long-term work of the IMO. At the same time, there are significant opportunities for cooperation between international regimes, such as with the UN climate regime on transparency, technology and MBMs.²²

In exploring the constraints and opportunities in determining the shipping industry's contribution, this report considers the principles and methods of maritime regulation and explores the tools and procedures available to the IMO. The IMO's mandate and traditional approach to maritime regulation will be tested to their limits. The report discusses the technical nature of maritime regulation and considers legal pathways for adopting an MBM measure, should it be needed.

The consideration of how the international shipping industry's fair contribution might be achieved also calls into question the relationship between multilateralism and unilateralism, including regionalism, in law making. Maritime regulation aspires to achieve global uniformity in state practice, in contrast to the flexibility inherent in national or regional approaches endorsed under the Paris Agreement. Historically, maritime regulation has experienced instances of unilateralism that at times appeared to undermine global efforts at achieving uniformity and at other times actually triggered the eventual adoption of higher global standards.²³ The European Union's position, albeit at the regional level, will be important to consider in this respect.

This report starts by setting out the international legal framework, with particular focus on the UN climate regime, international law of the sea and international maritime law on pollution prevention from ships, and also considers legal issues with respect to international trade law and EU regulation. The latter two are considered only in general terms, as they could potentially constitute separate lines of inquiry in their own right and are not the focus of this report. The report next addresses the challenge of regulating GHG emissions from international shipping by explaining the commercial and operational life of the ship, implications of its mobility, consequential global governance of the industry, how maritime regulation works, IMO efforts in regulating GHG emissions, and the range of actual and potential measures for GHG regulation from ships that have been considered to date. Discussion of lessons from other sectors follows, in part to illustrate the efforts undertaken in these sectors, and in part to explore whether there are useful experiences for international shipping to draw upon. Thereafter, the discussion addresses the core purpose of the report, namely the key issues for the determination of the "fair share" and potential legal pathways, including the management of uncertainty, prospective vision and timeline, role of maritime regulation, potential role of market measures, equity issues, compliance system, inter-regime consistency and complementarity, and IMO leadership. The report concludes with observations on general, policy and legal considerations for near future and long-term work on the IMO strategy.

20 *Initial IMO Strategy on Reduction of GHG Emissions from Ships*, MEPC Resolution MEPC.304(72) (13 April 2018) [*Initial IMO Strategy*]. For a report on the debate that led to its adoption, see *Report of the MEPC on its 72nd Session*, IMO Doc 72/17 (3 May 2018) [*MEPC 72 Report*], 33–45. The roadmap was adopted earlier at MEPC 70. *Report of the MEPC on its 70th Session*, IMO Doc MEPC 70/18 (11 November 2016) at 50–51 [*MEPC 70 Report*]; *Report of the MEPC on its 70th Session*, IMO Doc MEPC 70/18/Add.1 (11 November 2016), annex 11.

21 For a study exploring possible EU unilateral action on GHGs from the maritime sector on the basis of the sovereignty enjoyed by member states in their ports, see Aoife O'Leary, David Holyoake & Marta Ballesteros, *Legal Implications of EU action on GHG Emissions from the International Maritime Sector* (ClientEarth, 2011), online: ClientEarth <www.documents.clientearth.org/wp-content/uploads/library/2011-11-01-legal-implications-of-eu-action-on-ghg-emissions-from-the-international-maritime-sector-ce-en.pdf>.

22 *Paris Agreement*, *supra* note 8, arts 6 (Market-based Mechanisms), 10 (Technology Mechanism), 14 (Global Stocktake).

23 See Stuart Hetherington, "The Elusive Panacea of Uniformity: Is It Worth Pursuing?" (Paper presented at the AMTAC Annual Address 2013, Sydney, 18 September 2013), online: AMTAC <<https://amtac.org.au/publications-papers/>>.



THE INTERNATIONAL LEGAL FRAMEWORK

Evolution of the UN Climate Regime

The origins of the international climate change regime can be traced back to a series of United Nations General Assembly resolutions adopted in the late 1980s. These resolutions resulted in the negotiation of the UNFCCC, which was adopted at Rio de Janeiro in 1992, entered into force in 1994 and established the architecture for subsequent climate change agreements. The General Assembly resolutions also resulted in the establishment of the Intergovernmental Panel on Climate Change (IPCC) to give scientific and technical advice to negotiators and policy makers. Since 1990, the IPCC has prepared five comprehensive assessment reports on the state of the science on climate change, each at critical junctures of the development of the climate change regime as well as, on request, more focused reports on issues ranging from land use change and forestry issues to carbon capture and storage. The most recent synthesis report was released in 2014 to inform the negotiation of the Paris Agreement.²⁴

The UNFCCC continues to serve as the foundation and provides important institutions, goals and principles for the climate regime. The overall goal of the UNFCCC, described in article 2, is to stabilize GHG concentrations at levels that prevent dangerous human interference with the climate system, to ensure that the rate of change allows nature to adapt, to not threaten food production and to allow sustainable development to take place. This overall goal is refined through additional principles set out in article 3, including equity for present and future generations, CBDR-RC, and the need to take precautionary measures to anticipate and mitigate, prevent or minimize the effects of climate change.

The UNFCCC is the ultimate source of the mandate of the UN climate regime over the GHG emissions from international shipping. The foundations for this mandate include the goal in article 2, the principles in article 3 and reference to efforts to reduce emissions from transportation in article 4.1(c), in combination with the powers

²⁴ IPCC, *Climate Change 2014: Synthesis Report*, Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [IPCC 2014].

of the COP set out in article 7. Key among these powers is the general power to implement measures to meet the article 2 goal and to more broadly ensure the effective implementation of the convention. The need to mobilize finance is specifically referenced, providing the basis for carbon levies and other economic measures. A key potential limitation of the specific mandates set out in article 7 is the focus on parties rather than private actors, although measures directed at private actors are not specifically excluded.

The first substantive agreement following the UNFCCC was the Kyoto Protocol, negotiated in 1997.²⁵ While the key principles of the international climate change regime were accepted in 1997, the rules for implementation took much longer to develop. Most of these rules were finalized at the Seventh Conference of the Parties (COP 7) in November 2001 in Marrakech. The package of rules required to implement the Kyoto Protocol was then formally adopted at the first meeting of the parties to the protocol in Montreal in 2005. Upon its entry into force in 2005, the Kyoto Protocol became the heart of the international climate change regime. It established the first binding emissions reduction targets for each of the “developed countries” listed in Annex I of the UNFCCC for 2008 to 2012, the first commitment period.²⁶

At the core of the Kyoto Protocol are the GHG emissions reduction targets for developed states. Each Annex I country was assigned a negotiated combined emissions reduction target for the six gases covered in the protocol. The target was expressed relative to emissions in that state in 1990, and presented in tonnes of CO₂ equivalent emissions. This emissions reduction target was then translated into emissions permits assigned to each Annex I party for the five years of the 2008 to 2012 commitment period. These permits are called assigned amount units, and are the foundation of the emissions trading system under the protocol.

The flexibility mechanisms established in the Kyoto Protocol are the Clean Development Mechanism (CDM), Emissions Trading and Joint

Implementation. They were included in the Kyoto Protocol, at least in part in recognition that the state-specific targets for Annex I countries provided only a crude tool for balancing the relative responsibility, capacity and potential of parties to the protocol to reduce emissions. In that respect, the mechanisms provide a degree of flexibility to ensure that if meeting one party’s target through reductions turned out to be disproportionately expensive or technically difficult to achieve, that party had the option to delay reductions in its own country and instead support reductions in another country by using the flexibility mechanisms.

A further objective of one of the flexibility mechanisms, the CDM, was to address capacity concerns in developing countries (those not listed in Annex I). Some developing countries were in the process of making major capital investments in energy-producing and consuming technologies, and the flexibility mechanisms reflected the parties’ recognition that there would be significant long-term benefits to find ways to influence the choices made by developing countries at this stage of their development.

The dual purpose of the CDM, therefore, was to offer Annex I parties a compliance alternative where domestic emissions reduction has become too expensive, while at the same time providing developing countries with assistance in the form of technology transfer to encourage a more sustainable lower emissions development path. The parties to the Kyoto Protocol agreed that if reductions could be achieved more cost effectively in a developing country that has no reduction target, that country should be able to join forces with an Annex I party to achieve those reductions. In return for providing this assistance, an Annex I party would receive CDM credits that it could apply toward its emissions reduction targets.

The form of assistance was left somewhat open, but to receive the credits the Annex I party had to demonstrate that the emissions reductions achieved were additional to those that would have been achieved if the assistance had not been granted. The term used to describe this requirement is “additionality.” It means that the assistance provided in return for the credits must enable the reductions. The assistance will usually take the form of financial support through the purchase of the CDM credits. It could, however, take the form of providing access to technologies in return for CDM credits, or the transfer of expertise

²⁵ *Kyoto Protocol to the United Nations Framework Convention on Climate Change*, 11 December 1997, 2303 UNTS 148, 37 ILM 22 (entered into force 16 February 2005) [*Kyoto Protocol*].

²⁶ Joanna Depledge, “Chapter 2A: The Legal and Policy Framework of the United Nations Climate Change Regime” in Daniel Klein et al, eds, *The Paris Agreement on Climate Change: Analysis and Commentary* (Oxford, UK: Oxford University Press, 2017) 27; Meinhard Doelle, *From Hot Air to Action? Climate Change, Compliance and the Future of International Environmental Law* (Toronto: Carswell, 2005).

needed to implement a CDM project. The Kyoto Protocol's Emission Trading system establishes the rules under which the various forms of emission credits or units created under the protocol can be traded, taken out of circulation, used for compliance or saved. Through emissions trading, Annex I parties can make use, in meeting their emissions targets, of credits or units held by other Annex I parties, or generated under the CDM.²⁷

Articles 5, 7 and 8 of the Kyoto Protocol were designed to ensure that decisions about compliance and the use of the mechanisms are based on accurate, reliable and consistent information from all parties. To this end, article 5 requires Annex I parties to put in place a system for national emissions estimations on an annual basis in accordance with agreed-upon methodologies. Parties are required under article 5 to include emissions from domestic shipping in their national systems, but not those from international shipping. Article 5 allows for adjustments to be made to the emissions estimation if approved methodologies are not followed. Article 7 requires parties to use those national systems to report annually on emissions by source and removal by sink, again in accordance with approved methodologies. Article 8 provides for review, verification and adjustment of the information provided by expert review teams to ensure that parties' annual reporting on emissions and carbon sinks is accurate, consistent and complies with the agreed-upon methodologies.

The Kyoto compliance system is unique among compliance systems for multilateral environmental agreements (MEAs). On the one hand, it built on a long tradition among MEAs to facilitate compliance through capacity building, dialogue and transparency. On the other hand, it recognized the need for strong and consistent enforcement to establish a carbon market and to ensure that parties will make the investment needed to meet their emissions reduction targets. The result was a compliance system that seeks to facilitate and to enforce, using parallel processes where required. This meant that compliance issues that are deemed important for the functioning of the trading system

are subject to enforcement and facilitation, whereas matters not considered critical for the carbon market are subject only to facilitation. Facilitation and enforcement are carried out by separate branches of the compliance committee. Only the enforcement branch can impose penalties.²⁸

Decision 2/CP adopted by the Third UNFCCC Conference of the Parties alongside the decision adopting the Kyoto Protocol, requests further elaboration on the inclusion of emissions from international shipping to individual parties. However, parties have not yet agreed on this elaboration. In parallel, article 2.2 of the Kyoto Protocol requests Annex I parties to pursue limitation or reduction of emissions from that sector, working through the IMO. No elaboration on the inclusion of emissions from international shipping to individual parties was included in the Kyoto rulebook, nor agreed under in negotiations on the implementation of the first commitment period of the Kyoto Protocol. This resolution followed an effort to include international shipping within the emissions reduction commitments parties agreed to take on under the protocol.²⁹

The effort to include international shipping had been initiated with a UNFCCC Secretariat report that identified eight options, which were then reduced to five options through deliberations by the Subsidiary Body for Scientific and Technological Advice (SBSTA).³⁰ The five options selected by the SBSTA included the "no allocation" option, as well as allocation to the state where the bunker fuel is sold, allocation to the state of registration or ownership of the vessel, allocation to the state of origin or destination of the vessel, and allocation to the state of origin or destination of the cargo or passengers.³¹ No options have been selected from these five, and all remain open for adoption in the future. Addressing the emissions from this growing sector remained important for the achievement of the ultimate objectives of the UNFCCC, and

27 There has been much criticism of the environmental integrity of the CDM, with a recent study by the Institute for Applied Ecology in Berlin suggesting that most of the credits granted were for projects that would have proceeded without the support from the CDM mechanism. See Martin Cames et al, *How Additional is the Clean Development Mechanism?* (Corvallis, Oregon: Institute for Applied Ecology, 2016), online: IAE <https://ec.europa.eu/clima/sites/clima/files/ets/docs/clean_dev_mechanism_en.pdf>.

28 See Meinhard Doelle, "Early Experience with the Kyoto Compliance System: Possible Lessons for MEA Compliance System Design" (2010) 1 *Climate L* 237. See also Jutta Brunnee, Meinhard Doelle & Lavanya Rajamani, *Promoting Compliance in an Evolving Climate Change Regime* (Cambridge, UK: Cambridge University Press, 2012).

29 The implication of the reference to the IMO in article 2.2 has been the subject of considerable debate within the climate regime as well as the IMO. For an overview, see Shi, *supra* note 15 at 94.

30 *Methodological Issues, Decision 4/CP.1*, Report of the Conference of the Parties on its First Session, UN Doc FCCC/CP/1995/7/Add.1 (7 April 1995), art 1(f) at 16.

31 See Sebastian Oberthür, "Institutional Interaction to Address Greenhouse Gas Emissions from International Transport: ICAO, IMO and the Kyoto Protocol" (2003) 3:3 *Climate Pol'y* 191 at 193.

therefore resurfaced once the attention of parties to the UNFCCC turned to the post-2012 negotiations.

Informal efforts to start negotiations on the post-2012 regime commenced once the rulebook for the implementation of the Kyoto Protocol was negotiated in 2001. By 2002 in New Delhi, the European Union started to focus on post-2012 negotiations. However, the United States was not willing to allow a formal negotiating process to be started and the developing world was unwilling to discuss emissions reductions outside the developed world because, in its view, Australia, Europe, Japan, New Zealand and North America had failed to lead by example, and insufficient progress had been made on adaptation.³²

Negotiations for the post-2012 regime did not formally proceed until the Eleventh Conference of the Parties/First Meeting of the Parties (MOP 1) in December 2005 in Montreal. It took a decade for these negotiations to be concluded successfully in Paris in December 2015. Emissions from international shipping and aviation remained on the agenda throughout these negotiations. Efforts to bring international shipping under the UNFCCC initially took place under the Bali Action Plan (2007–2012), and then under the Durban Platform (2012–2015) that provided the basis for negotiating the Paris Agreement.³³ It is worth noting that the Bali Action Plan specifically provided for international transport under Cooperative Sectoral Approaches, the only item under the plan that resulted in no agreed outcome.³⁴

The Paris Agreement

The key elements of the approach to climate mitigation in the Paris Agreement consist of collective long-term goals, accompanied by a number of elements: nationally determined mitigation efforts; five-year review cycles of progress in implementing individual efforts toward the collective goals; and a commitment to increase ambition as part of the five-year review cycles to

ensure that collective long-term goals are met. This section offers a brief overview of these elements.

The first of the key elements of the Paris Agreement is its set of long-term goals. The objective of keeping global average temperature increase to “well below” 2°C, and the aspiration to limit this increase to 1.5°C, are at the heart of the Paris Agreement.³⁵ The temperature goal is supplemented with a commitment to ensure emissions peak as soon as possible, and to reach a balance of emissions removals in the second half of the century. Arguably, 1.5°C has now become the ultimate standard against which the success of collective mitigation efforts under the UNFCCC will be measured, and it seems likely that 1.5°C scenarios being explored by the IPCC will conclude that GHG emission neutrality will have to be reached before 2050.³⁶ This ambitious set of long-term goals provides an important foundation for each state’s future nationally determined contributions (NDCs), their justification on the grounds of equity, and the five-year cycles of NDC communication and the global stocktake. Over time, as the IPCC completes its scenario work, the “well below 2°C” and “1.5°C” goals can be expected to shape further discussions on elements of the long-term ambition, such as specific time frames for the expressed need for global emissions to peak as soon as possible and for reaching a balance of emissions and removals.³⁷

The long-term temperature goal also provides important context for other key elements of the Paris Agreement, in particular, adaptation and finance.³⁸ Meeting the long-term goal is an essential pre-condition for successful adaptation efforts, and finance, in turn, is critical for meeting both the mitigation and adaptation goals of the Paris Agreement. Important connections are made to poverty eradication and sustainable development. Through the process to be designed for the global stocktake under article 14, the long-term goal articulated in article 2 is

32 Meinhard Doelle, “The Cat Came Back, or the Nine Lives of the Kyoto Protocol” (2006) 16 J Envtl L & Prac 261.

33 *Bali Action Plan, Decision 1/CP.13*, Report of the Conference of the Parties on its Thirteenth Session, UN Doc FCCC/CP/2007/6/Add.1 (14 March 2008) at para 1b(iv) [*Bali Action Plan*].

34 Decisions Adopted by the Conference of the Parties, *Decisions 1-10/CP.18*, Report of the Conference of the Parties on its Eighteenth Session, held in Doha from 26 November to 8 December 2012, UN Doc FCCC/CP/2012/8/Add.1 (28 February 2013).

35 *Paris Agreement*, *supra* note 8, art 2.1.

36 Andreas Fischlin, “Chapter 1A: Background and Role of Science” in Klein et al, *supra* note 26 at 3. For updates on progress on the IPCC Special Report on Global Warming of 1.5°C, online: IPCC <www.ipcc.ch>.

37 Halldór Thorgeirsson, “Chapter 7: Objective (Article 2.1)” in Klein et al, *supra* note 26 at 123.

38 Irene Suárez Pérez & Angela Churie Kallhauge, “Chapter 12: Adaptation” in Klein et al, *supra* note 26 at 196; Jorge Gastelumendi & Inka Gnitke, “Chapter 14: Climate Finance (Article 9)” in Klein et al, *supra* note 26 at 239.

expected to become the ultimate guide for the implementation of the Paris Agreement.³⁹

The starting point for mitigation in the Paris Agreement is the overall mitigation effort, largely represented by the individual NDCs measured against the long-term temperature goal, but supplemented by efforts outside the UN climate regime, such as efforts of the IMO and ICAO, and initiatives under the ozone regime to eliminate the use of HFCs.⁴⁰ Parties recognized in Paris that the initial NDCs would not add up to an adequate collective effort in light of the long-term goal. NDCs are therefore to be strengthened, informed in 2018 by the Talanoa Dialogue (a facilitative dialogue under the UNFCCC on ways to increase ambition),⁴¹ and then every five years starting in 2025, following a global stocktaking exercise carried out two years before each updated NDC is due.⁴² The Paris Agreement offers important guidance on how parties are to determine the adequacy of their NDCs with respect to mitigation.⁴³

Article 4.1 of the Paris Agreement provides that parties will aim to reach global peaking of emissions as soon as possible, and to undertake rapid reductions thereafter based on science and equity. Parties recognize that it will take longer for developing country emissions to peak, putting pressure on developed countries to accelerate their emissions reductions to achieve a global peaking as soon as possible. Parties are to achieve a collective balance between emissions and removals of GHG from the atmosphere in the second half of the century, suggesting that GHG concentrations should stabilize and start to decline some time after 2050.⁴⁴

These provisions offer some clarity on the scale and allocation of mitigation efforts, and create a

number of procedural obligations, but they provide neither a method for determining appropriate NDCs for individual parties nor a legal obligation to fully implement NDCs and meet targets. It is noteworthy that the long-term mitigation goals are framed in technology-neutral language and thereby leave open how much specific technologies, from renewable energy to carbon capture and storage and the enhancement of sinks, should contribute to the effort. The additional guidance for parties on what is expected of them takes on added significance as the Paris outcome explicitly recognizes that there is an ambition gap between commitments made by parties to date and the long-term goal. The ambition gap is quantified in Decision 1/CP.21 to be upward of 15 gigatonnes by 2030, based on the 2°C goal.⁴⁵

The Paris Agreement affirms the importance of the enhancement and conservation of sinks, and specifically mentions forests in this context.⁴⁶ The agreement confirms that international emissions trading and other market mechanisms are acceptable tools for parties to meet their emissions reduction goals, as long as they increase the level of ambition.⁴⁷ The agreement sets out general principles for the use of market mechanisms, such as the avoidance of double-counting, environmental integrity, robust accounting and transparency. The Paris Agreement also makes provision for non-market approaches to assist parties with the implementation of their NDCs.

Detailed rules for these various mechanisms will have to be established before a thorough assessment of their environmental integrity and their potential to contribute to the ultimate objective of the Paris Agreement can be carried out. These provisions of the agreement offer possible tools for addressing GHG emissions from international shipping, should the results of the Talanoa Dialogue or the global stocktake under article 14 lead parties to conclude that insufficient progress on this issue through the efforts of the IMO risks undermining the goals of the Paris Agreement. They also offer important avenues for collaboration between the UN climate regime

39 Jürgen Friedrich, "Chapter 19: Global Stocktake (Article 14)" in Klein et al, *supra* note 26 at 319.

40 *Kigali Amendment to the Montreal Protocol on Hydro Fluorocarbons*, 15 October 2016 (not in force), online: Montreal Protocol <<http://conf.montreal-protocol.org/meeting/mop/mop-28/crps/SitePages/Home.aspx>>.

41 Established by COP 23 in November 2017, the Talanoa Dialogue now has an active online platform that enables submission of inputs by parties and stakeholders. "Talanoa Dialogue", online: UNFCCC <talanoadialogue.com>. The Talanoa Dialogue is intended to encourage parties to increase the ambition of their 2020 mitigation and finance commitments and to increase ambition more generally, and is expected to serve as a dry run for the first global stocktake under the Paris Agreement in 2023.

42 *Paris Agreement*, *supra* note 8, refers to highest ambition and the need for progression (art 4.3), and new NDCs every five years (art 4.9) informed by the global stocktake (arts 4.9, 14).

43 Harald Winkler, "Chapter 9: Mitigation (Article 4)" in Klein et al, *supra* note 26 at 141.

44 *Ibid.*

45 Decisions adopted by the Conference of the Parties, *Decision 1/CP.21*, Report of the Conference of the Parties on its Twenty-first Session, held in Paris from 30 November to 13 December 2015, Addendum, UN Doc FCCC/CP/2015/10/Add.1 (29 January 2016) at para 17 [*Decision 1/CP.21*].

46 *Paris Agreement*, *supra* note 8, art 5.

47 *Ibid.*, art 6.

and the IMO, such as on transparency, technology and implementation of an MBM for the sector.⁴⁸

The transparency rules apply to all parties, with some modest differentiation, mainly through a commitment to flexibility and support for developing countries. For all parties, the information they submit will be subject to a technical expert review and a multilateral, facilitative consideration of progress. Importantly, flexibility with respect to transparency is specifically linked to capacity, not to the broader concept of CBDR-RC. Special accommodations are included for the LDCs and SIDS.⁴⁹ Transparency is a focus of capacity-building efforts under the Paris Agreement, a signal that developed state parties are motivated to help build capacity in developing countries in order to minimize differentiation on transparency.⁵⁰ This signal to a nuanced approach to differentiation should facilitate discussions under the IMO to resolve the relationship between CBDR and NMFT.⁵¹

The Paris Agreement signals the intention to build on and enhance transparency arrangements under the UNFCCC, including national communications, biennial reports and update reports, international assessment and review and international consultation and analysis.⁵² It specifically calls for more regular and comprehensive reporting, a more harmonized verification process,⁵³ and common modalities, procedures and guidelines.⁵⁴ The Paris Agreement offers a surprising level of detail on accounting and reporting in the 15 paragraphs of article 13. This is further supplemented with specific references to transparency in key provisions on mitigation, adaptation, finance and capacity building.⁵⁵ Detailed rules are currently being negotiated. It is unclear at this point whether the transparency rules will include any obligation to report on emissions from the international shipping sector beyond

the current guidelines for preparing national inventories. Parties, of course, are free to include international shipping in their NDCs in some form and can report on emissions from the sector.

The establishment of a five-year review and ambition cycle, including the Talanoa Dialogue in 2018 and the global stocktake process starting in 2023, constitute another core element of the overall effort to ensure the goals of the Paris Agreement are met through the collective efforts of parties in cooperation with other regimes. The global stocktake set out in article 14 covers mitigation, adaptation, means of implementation and support. The first global stocktake is to take place in 2023, in time for the revision of parties' NDCs by 2025. The goal of the global stocktake is to enhance both national action and international cooperation, a clear signal that international shipping will be an area of focus for the global stocktake. The Talanoa Dialogue, an initial stocktaking process among parties, originally called the "facilitative dialogue," is scheduled for 2018 and will serve as a first experiment with this review and ambition cycle under the Paris Agreement.⁵⁶

The compliance mechanism is to be facilitative, non-adversarial and non-punitive in nature, and applies to all parties.⁵⁷ The compliance committee is to consist of 12 members with relevant technical expertise, with membership determined in a manner similar to the facilitative branch of the compliance committee under the Kyoto Protocol.⁵⁸ The committee is directed to be sensitive to national capabilities and circumstances of parties in carrying out its work.⁵⁹

The transparency provisions with respect to parties' implementation of their NDCs, in combination with the global stocktake and the compliance system, are at the heart of the process put in place under the Paris Agreement to ensure progression of individual and collective ambition toward the long-term goal. The basic elements are in place in the form of articles 13 to 15, and they appear sound. However, the detailed rules have

48 Andrew Howard, "Chapter 11: Voluntary Cooperation (Article 6)" in Klein et al, *supra* note 26 at 178.

49 *Paris Agreement*, *supra* note 8, arts 13.7–13.10; *Decision 1/CP.21*, *supra* note 45 at paras 89–90.

50 *Paris Agreement*, *supra* note 8, arts 11, 13.15; *Decision 1/CP.21*, *supra* note 45 at paras 84–88.

51 Yamide Dagnet & Kelly Levin, "Chapter 18: Transparency (Article 13)" in Klein et al, *supra* note 26 at 301.

52 *Paris Agreement*, *supra* note 8, art 13.4.

53 Through a technical expert review; see *ibid*, arts 13.11–13.12.

54 *Ibid*, art 13.13.

55 *Ibid*, arts 4.8, 4.13, 6.2, 7.5, 9.7, 11.1. Transparency is referenced throughout *Decision 1/CP.21*, *supra* note 45; Dagnet & Levin, *supra* note 51.

56 *Decision 1/CP.21*, *supra* note 45 at para 20. See also Friedrich, *supra* note 39.

57 *Paris Agreement*, *supra* note 8, art 15.

58 *Decision 1/CP.21*, *supra* note 45 at para 102. Interestingly, there is no reference back to the detailed rules of procedure developed for the Compliance Committee under the Kyoto Protocol.

59 *Paris Agreement*, *supra* note 8, art 15.2. See also Yamide Dagnet & Eliza Northrop, "Chapter 20: Facilitating Implementation and Promoting Compliance (Article 15)" in Klein et al, *supra* note 26 at 301.

yet to be finalized. Furthermore, the success of the transparency, review, stocktaking and compliance approach in the Paris Agreement in increasing ambition sufficiently to meet the long-term goal will ultimately depend on many factors outside the purview of the new climate regime, most notably the economic, political and social circumstances in key state parties.

The Paris Agreement does not repeat the call in the Kyoto Protocol for parties to work through the IMO to address GHG emissions from international shipping. The legal status of the Kyoto Protocol, and with it the status of article 2.2, are unclear at this time. This raises interesting questions about the potential impact for the mandate of the IMO in case of the formal and complete replacement of the Kyoto Protocol with the Paris Agreement.

Furthermore, it is important to point out that the draft negotiating text of the Paris Agreement did include proposals from some parties for specific reference to international shipping and aviation. The draft text included the following options:

23bis. [In meeting the 2°C objective, Parties agree on the need for global sectoral emission reduction targets for international aviation and maritime transport and on the need for all Parties to work through the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO) to develop global policy frameworks to achieve these targets].⁶⁰

...

47.5 Option (a):

...

b. Encourage the International Civil Aviation Organization and the International Maritime Organization to develop a levy scheme to provide financial support for the Adaptation Fund.

c. In establishing the levy scheme, ICAO and IMO are encouraged to take into consideration the needs of developing countries, particularly the LDCs,

SIDS and countries in Africa heavily reliant on tourism and international transport of traded goods.⁶¹

These proposals were not included in the final version of the Paris Agreement. For now, international shipping has not been included in the emissions reduction commitments of parties in the form of their NDCs. There has also been no change in the emissions that parties have to account for under the Kyoto Protocol. Reporting obligations under the Paris Agreement are still being negotiated. Of course, as indicated above, there is nothing in the Paris Agreement to prevent a party from reporting on emissions from international shipping, or from including international shipping in some form in its NDC. While the Paris Agreement does not mention emissions from international shipping, and the IMO is continuing its efforts to develop a strategy to address them, the absence of any reference to this mandate in the agreement has the potential to strengthen the hand of the UN climate regime going forward. If it had made specific reference to the IMO, the result may have been to discourage parties to the UN climate regime from taking responsibility for these emissions. Because the Paris Agreement is silent on the efforts of the IMO, the extent to which the UN climate regime can be taken to have endorsed the mandate of the IMO or to have delegated the issue to it remains uncertain. This may also affect the relevance of CBDR in the IMO's efforts to regulate emissions from the sector.⁶² In practice, and for practical purposes, the IMO is using its treaty mandate to lead the shipping industry's efforts and it has reported to the UNFCCC process and structures. What is clear is that the UN climate regime will continue to monitor progress as part of the Talanoa Dialogue in 2018, and the global stocktake under the Paris Agreement thereafter. Pressure to act will remain on parties to the UN climate regime, who are also IMO member states, in case of inadequate progress at the IMO as it continues work on the strategy.

So what avenues are there in the Paris Agreement to become more actively involved in efforts to reduce emissions from international shipping and aviation? Most importantly, perhaps, unlike the Kyoto Protocol with its focus on the emissions of developed country (Annex I)

60 *Outcomes of the United Nations Climate Change Conferences held in Lima in December 2014 and in Geneva in February 2015*, Note by the Secretariat, IMO Doc MEPC 68/5 (18 February 2015) at 3.

61 *Ibid* at 4.

62 See Shi, *supra* note 15 at 94.

parties, the overall focus of the Paris Agreement is on global emissions and a global temperature goal of “well below” 2°C while striving for 1.5°C. Article 4.1 of the Paris Agreement refers to all emissions and does not exclude emissions from international shipping. Article 4(4) refers to developed countries “undertaking economy-wide absolute emission reduction targets.”

The expectation is that both the Talanoa Dialogue and the global stocktake under article 14 (including the science input from the IPCC) will include emissions from international shipping. In addition, the issue remains on the agenda of the SBSTA, the subsidiary body of the UN climate regime mandated to provide information and advice on scientific and technological matters. This provides the possibility, if all else fails, of revisiting, and taking a decision on the five options identified by the SBSTA in the lead-up to Kyoto, and thereby clarifying and standardizing the allocation of emissions from international shipping to parties. Finally, article 6, dealing with market and non-market mechanisms, may provide avenues for measures under the Paris Agreement to address emissions from international shipping.⁶³

All this means that, at a minimum of every five years, starting in 2018 with the Talanoa Dialogue, and in 2023 in the form of the global stocktake under the Paris Agreement, parties should receive reports on emissions from international shipping as part of the overall exercise to determine progress toward the temperature goal. In cases where parties are meeting or exceeding their individual mitigation commitments, but the collective effort continues to fall short due in part to insufficient efforts to reduce emissions from international shipping, the pressure for the UN climate regime, or parties thereto, to take charge of these emissions will be immense.

A critical element in ensuring the international shipping sector will do its part will be full transparency. One option would be for the IMO, or state parties as part of their NDC submissions, to report on emissions from these sectors as part of the Talanoa Dialogue and the global stocktake. Equally important will be reporting on efforts

and targets going forward, and consistency of methodologies for estimating and reporting on emissions from shipping between the IMO and the UNFCCC. For the Talanoa Dialogue, a particularly important question will be the contribution of the sector to closing the 2030 emissions gap. Of course, individual parties can also be asked to report on emissions from these sectors in their inventories under article 13. Either way, it will be critical that accurate and consistent information about emissions trajectories in the international shipping sector be made available every five years starting in 2018. Ideally, this would lead to an assessment of the approaches that have been implemented, which have been effective and which have not. This will allow parties to the UN climate regime to determine, in the context of the overall five-year review and stocktake cycles, whether adequate efforts are being made outside the regime (or collaboratively), or whether it is time to take additional measures either within the UN climate regime or collaboratively between the UN climate regime and the IMO. In practice, since parties to the climate regime and IMO member states are the same actors, consistency should be expected. In addition, as discussions on sources of funding for climate mitigation, adaptation and loss and damage continue under the UN climate regime, the idea of imposing a levy on emissions from international transport is likely to continue to surface in the climate negotiations.⁶⁴

In short, the effort to influence, control and eventually eliminate GHG emissions from international shipping and aviation within the climate regime or in coordination with it is far from over. Full transparency during the review and stocktake cycles will be critical to ensure these sectors contribute their fair share to the global effort. Since states are parties to both the climate and maritime regimes, they would benefit from exploring opportunities for consistency and cooperation, including the possibility to utilize institutions and instruments under the Paris Agreement for market mechanisms, finance and technology to help with speedy and effective implementation of measures negotiated under the IMO process. In the short and medium term, until technology breakthroughs point to a clear zero-emissions path for shipping and aviation,

63 As discussed below in the section entitled “Determination of the International Shipping Industry’s ‘Fair Share’ and Potential Legal Pathways,” the potential under article 6 of the Paris Agreement is, of course, not limited to situations where the parties to the UN climate regime conclude that efforts by the IMO are inadequate. There is every opportunity for a cooperative approach, certainly with respect to MBMs under article 6, technology under article 10, transparency under article 13 and the global stocktake under article 14.

64 The sharing of proceeds under article 6, for international transfers of emissions obligations, provides a sound basis for implementing such a levy.

these sectors may need to take further efficiency measures, take measures to accelerate technology breakthroughs, or both, to make a fair contribution to the global effort. A more controversial option would be to fund emissions reductions outside the international shipping sector in some form. Aviation has taken tentative steps in the latter direction. In the long term, the science is clear that meeting the temperature goal set in Paris will require a “balance of emissions and removals,” and very likely significant net negative emissions, making anything short of a zero-emissions solution for these sectors untenable.⁶⁵

The LOSC

With 168 state parties⁶⁶ at the time of writing and as the “constitution for the oceans,”⁶⁷ the LOSC plays an important role in providing the jurisdictional framework applicable to international shipping and substantive rules for the protection and preservation of the marine environment. In Part XII of the Convention, article 192 establishes a generic duty for all states to protect and preserve the marine environment.⁶⁸ In a recent Annex VII arbitration under the LOSC, it was held that the “obligations in Part XII apply to all States with respect to the marine environment in all maritime areas, both inside the national jurisdiction of States and beyond it.”⁶⁹ Article 192 concerns “the positive obligation to take active measures to protect and preserve the marine environment, and by logical implication, entails the negative obligation not to degrade the marine environment.”⁷⁰ The tribunal observed that there is a body of international environmental law that informs article 192 and it is generally to the effect that states should ensure that activities within their jurisdiction and control should respect the environment within their jurisdiction and beyond. Consequently,

states have a positive duty to prevent or at least mitigate environmental harm. As an integral part of the corpus of international environmental law, the Paris Agreement serves to inform the content of article 192. The consequence is that the positive duty concerning atmospheric emissions is not territorially bound and applies equally to all states with respect to the airspace under their sovereignty and to their ships in any location.

More specifically with respect to shipping, the LOSC stipulates a duty to take measures to minimize pollution from vessels.⁷¹ It further provides for all states to “adopt laws and regulations to prevent, reduce and control pollution of the marine environment from or through the atmosphere, applicable to the air space under their sovereignty and to vessels flying their flag or vessels,” bearing in mind “internationally agreed rules, standards and recommended practices and procedures.”⁷² This duty extends to taking other necessary measures “to prevent, reduce and control such pollution.”⁷³ For these purposes, states are encouraged “to establish global and regional rules, standards and recommended practices and procedures to prevent, reduce and control such pollution” through the IMO or diplomatic conference.⁷⁴ LOSC state parties have performed these responsibilities through the IMO with the adoption of MARPOL Annex VI in 1997 and its numerous amendments, as discussed below.

The extent to which and the manner in which state parties may regulate and enforce atmospheric pollution from ships is subject to the jurisdictional provisions in the LOSC. The flag state has primary jurisdiction over its ships, irrespective of location, and on the high seas that jurisdiction is exclusive, with very few exceptions.⁷⁵ The flag state’s jurisdictional rights are subject to the duty to exercise effective jurisdiction and control over its ships⁷⁶ and to ensure compliance by its ships with applicable international rules and standards adopted by the

65 IPCC 2014, *supra* note 24.

66 UN Division for Ocean Affairs and the Law of the Sea, Chronological Lists of Ratifications, Accessions and Successions (3 April 2018), online: <www.un.org/depts/los/reference_files/chronological_lists_of_ratifications.htm>.

67 “A Constitution for the Oceans”, Remarks by Tommy B Koh, President of the Third United Nations Conference on the Law of the Sea in *The Law of the Sea: United Nations Convention on the Law of the Sea* (United Nations, 1983) at xxxiii, online: <www.un.org/Depts/los/convention_agreements/texts/koh_english.pdf>.

68 LOSC, *supra* note 9, art 192.

69 *In the Matter of the South China Sea Arbitration, The Philippines v People’s Republic of China*, Award, 12 July 2016, PCA Case No 2013-19 at para 940.

70 *Ibid* at para 941.

71 LOSC, *supra* note 9, art 194.3(b).

72 *Ibid*, art 212.1.

73 *Ibid*, art 212.2.

74 *Ibid*, art 212.3.

75 For example, the duty to cooperate for the suppression of piracy on the high seas; *ibid*, art 100.

76 *Ibid*, art 94.1. Under article 94.5, the flag state also has to act in conformity with “generally accepted international regulations, procedures and practices” and it is “to take any steps which may be necessary to secure their observance.”

IMO for the prevention, reduction and control of pollution of the marine environment.⁷⁷

Coastal states enjoy limited jurisdiction over foreign ships as they exercise their navigation rights in accordance with the LOSC. In the territorial sea, they may adopt laws and regulations with respect to the exercise of innocent passage, including for “the preservation of the environment of the coastal state and the prevention, reduction and control of pollution thereof.”⁷⁸ In theory, this legislative power could apply to atmospheric emissions from ships. However, “[S]uch laws and regulations shall not apply to the design, construction, manning or equipment of foreign ships unless they are giving effect to generally accepted international rules or standards.”⁷⁹ The logical consequence is that unilateral rules and standards on atmospheric emissions inconsistent with MARPOL Annex VI may not be legislated and enforced. The coastal state has a duty not to hamper navigation by imposing requirements on foreign ships “which have the practical effect of denying or impairing the right of innocent passage.”⁸⁰ In turn, foreign ships exercising innocent passage have a duty to comply with coastal state laws.⁸¹ Passage that involves “any act of wilful and serious pollution contrary to this Convention” is not innocent and is “considered to be prejudicial to the peace, good order or security of the coastal State,”⁸² potentially entailing enforcement consequences.⁸³ An analogous regime applies to passage in archipelagic waters in the absence of archipelagic sea lanes.⁸⁴ Where archipelagic sea lanes are established through the IMO, foreign ships are required to observe the sea lanes and routeing measures that are adopted for that purpose.⁸⁵ During transit passage through straits used for international navigation, the coastal state enjoys less jurisdiction over foreign ships. The power to legislate is limited to “the prevention, reduction and control of pollution, by giving effect to applicable international regulations regarding the discharge of oil, oily wastes and other noxious substances

in the strait.”⁸⁶ Atmospheric emissions from ships could be characterized as noxious substances because of their environmental and public health impacts. Foreign ships are expected to comply with such laws.⁸⁷ A separate provision requires foreign ships to observe the broader duty to “comply with generally accepted international regulations, procedures and practices for the prevention, reduction and control of pollution from ships.”⁸⁸

In general, port entry is a privilege, not a right,⁸⁹ and when a vessel enters into port voluntarily, it is implicitly submitting itself to local law and jurisdiction. In turn, the port state, which enjoys sovereignty over its internal waters (including port waters), has the sovereign right to exercise jurisdiction and enforce its laws and regulations.⁹⁰ Under the Convention and Statute on the International Regime of Maritime Ports, 1923,⁹¹ state parties undertake to grant access to the ships of other state parties to the ports under their sovereign authority on the basis of reciprocity and equality of treatment, including dues and charges of all kinds.⁹² And under the Convention on Facilitation of International Maritime Traffic, 1967,⁹³ state parties have further committed to adopt “all appropriate measures to facilitate and expedite international maritime traffic and to prevent unnecessary delays to ships and to persons and property on board.”⁹⁴ State parties “undertake to co-operate in securing the highest practicable degree of uniformity in formalities, documentary requirements and procedures in all matters in which such uniformity will facilitate and improve international maritime traffic and keep to a minimum any alterations in formalities, documentary requirements and procedures necessary to meet special requirements of a domestic nature”⁹⁵ and for this purpose to cooperate through the IMO.⁹⁶ As will be seen below, port states play an important role in the

⁷⁷ *Ibid*, art 217.1.

⁷⁸ *Ibid*, arts 21.1(f), 211.4.

⁷⁹ *Ibid*, art 21.2.

⁸⁰ *Ibid*, art 24.1(a).

⁸¹ *Ibid*, art 21.4.

⁸² *Ibid*, arts 19.1, 19.2(h).

⁸³ “The coastal State may take the necessary steps in its territorial sea to prevent passage which is not innocent.” *Ibid*, art 25.1.

⁸⁴ *Ibid*, art 52.

⁸⁵ *Ibid*, art 53.11.

⁸⁶ *Ibid*, art 42.1(b).

⁸⁷ *Ibid*, art 42.4.

⁸⁸ *Ibid*, art 39.2(b).

⁸⁹ AV Lowe, “The Right of Entry into Maritime Ports in International Law” (1977) 14 *San Diego L Rev* 597.

⁹⁰ LOSC, *supra* note 9, art 2.

⁹¹ *Convention and Statute on the International Regime of Maritime Ports*, 9 December 1923, 58 *LNTS* 285 (entered into force 2 December 1926).

⁹² *Ibid*, art 2.

⁹³ *Convention on Facilitation of International Maritime Traffic*, 9 April 1965, 591 *UNTS* 265 (entered into force 5 March 1967).

⁹⁴ *Ibid*, art I.

⁹⁵ *Ibid*, art III.

⁹⁶ *Ibid*, art IV.

enforcement of air pollution rules under MARPOL Annex VI. A port inspection regime has been designed for this purpose through the IMO. Further, under the LOSC, port states have an important role in assisting a coastal state to pursue proceedings against a foreign ship within whose jurisdiction it may have discharged pollutants into the marine environment, including atmospheric emissions.⁹⁷

The enforcement of atmospheric pollution from ships is couched as a duty for all states “within the air space under their sovereignty” (i.e., internal waters, territorial sea and archipelagic waters) and for flag states with respect to their ships on the basis of the international rules and standards for such pollution adopted through the IMO.⁹⁸ States have a duty to adopt laws and regulations and take other measures necessary to implement the IMO rules.⁹⁹ The performance of this duty is effected through the implementation and enforcement of MARPOL Annex VI, an optional annex. By and large, and considering some textual ambiguities or inconsistencies, the jurisdictional and substantive atmospheric pollution provisions described above are complementary to the development of the MARPOL Annex VI regime with respect to GHG emissions.¹⁰⁰

The International Convention for the Prevention of Pollution from Ships

The International Convention for the Prevention of Pollution from Ships, 1973, as amended by and incorporated in the protocol of 1978 (MARPOL),¹⁰¹ is the most important international maritime convention for the prevention of vessel-source pollution. MARPOL consists of a framework convention, as amended by the protocol of 1978, and six annexes, the first two of which are mandatory, while the rest are optional. There are 155 state parties to the convention proper and mandatory annexes (oil pollution; noxious liquid substances in bulk), representing 99.14

percent of global tonnage.¹⁰² Optional annexes III (harmful substances carried in packaged form), IV (sewage), and V (garbage) also enjoy high subscription levels.¹⁰³ Annex VI was introduced into MARPOL through the protocol of 1997.¹⁰⁴ Although optional, Annex VI has 88 state parties representing 96.16 percent of global tonnage. Annex VI is the regulatory vehicle for GHG emissions from international shipping. In principle, states that are not parties to Annex VI are under no legal obligation to implement and enforce those rules.

The technical regulation of shipping in MARPOL occurs in the annexes, as well as ancillary codes (which may be mandatory or voluntary) and guidelines. The implementation and enforcement of MARPOL standards is a responsibility of all state parties. In addition to the jurisdiction of the flag state, port states play an important role in enforcing MARPOL as guided by the NMFT principle that guides inspections of all ships, irrespective of flag and irrespective of whether the inspected ship is flagged in a MARPOL state party or not. Thus, although a state may not be under a legal Annex VI obligation because it is not a party to that instrument, in practice the owners of ships registered in that state have to consider that Annex VI standards would still be applied to their ships while trading in a foreign port where Annex VI is applicable law.

MARPOL is a key convention enforced in regional memoranda of agreement on port state control between national maritime administrations. With adoption facilitated by the IMO, these regional agreements are potentially vital for the enforcement of GHG regulations under Annex VI. Ships voluntarily calling into a MARPOL state party port or anchorage are inspected regularly for compliance with the international rules and standards of selected maritime conventions,

⁹⁷ LOSC, *supra* note 9, art 218.

⁹⁸ *Ibid*, art 222, with reference to the international rules and standards adopted by the IMO under art 212.3.

⁹⁹ *Ibid*, art 222.

¹⁰⁰ See Shi, *supra* note 15 at 288.

¹⁰¹ MARPOL, *supra* note 10. Annexes I and II entered into force on the same date as the convention. The other annexes entered into force on different dates as described in table 2.

¹⁰² IMO, “Status of Treaties” (13 September 2017), online: IMO <www.imo.org> [IMO, “Status of Treaties”].

¹⁰³ The number of state parties and representation of global tonnage are as follows: Annex III – 147/98.54 percent; Annex IV – 141/96.28 percent; Annex V – 152/98.72 percent. *Ibid*.

¹⁰⁴ 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, 26 September 1997, Can TS 2010 no 14 [entered into force 19 May 2005] [Protocol of 1997].

including MARPOL.¹⁰⁵ Inspectors make note of and report deficiencies and the ensuing sanction could be a reprimand, a requirement to rectify the deficiency and, in the case of serious deficiencies, can include port detention until the deficiency is rectified. Occasionally, a ship may be permitted to embark on a restricted voyage to another port to rectify the deficiency. Port detention is a powerful incentive for ships to comply with international standards. Port detentions can be very costly for any shipowner or charterer, as it could entail loss of charter days, loss of lay time potentially incurring demurrage charges (liquidated damages as a penalty), additional berth costs and late delivery of cargo in violation of applicable just-in-time delivery terms.

In actuality MARPOL is not solely focused on the prevention of pollution of the marine environment. The definition of “harmful substances” includes “any substance subject to control by the present Convention,”¹⁰⁶ and “discharge” includes “emitting,”¹⁰⁷ thus including Annex VI emissions. Annex VI addresses air pollution through emissions of ozone-depleting substances, sulphur oxides (SOx), nitrogen oxides (NOx), volatile organic compounds, particulate matter and shipboard incineration.¹⁰⁸ Relevant to the reduction of GHG emissions, pertinent measures include mandatory technical and operational energy efficiency measures, namely the Energy Efficiency Design Index (EEDI) and Ship Energy Efficiency Management Plan (SEEMP),¹⁰⁹ both discussed below in this report, as well as new fuel reporting requirements. Developing countries are assisted with respect to the implementation of

these technical rules.¹¹⁰ Annex VI also regulates the sulphur content permitted in bunkers.¹¹¹

Annex VI places restrictions on atmospheric releases in designated emissions control areas (ECAs) designated by the MEPC on the basis of proposals by state parties.¹¹² ECAs are areas “where the adoption of special mandatory measures for emissions from ships is required to prevent, reduce and control air pollution from NOx or SOx and particulate matter or all three types of emissions and their attendant adverse impacts on human health and the environment.”¹¹³ To date, ECAs have not been adopted for the regulation of GHG emissions and it remains to be seen whether they could constitute tools for this purpose at the regional level. The above definition of ECA appears generic enough to support a proposal for the designation in specific marine regions to achieve regional environmental goals, presumably also for GHG emissions.

The comprehensive approach to vessel-source pollution is a major strength of the MARPOL system. However, there appears to be a disconnect between, on the one hand, the optional character of most of its annexes, including Annex VI, and, on the other hand, the general obligations under the LOSC for the protection of the marine environment at the global and regional levels without excluding

105 See e.g. *Paris Memorandum on Port State Control*, 26 January 1982, 21 ILM 1982 (entered into force 1 July 1982), online: Paris MoU <www.parismou.org/inspections-risk/library-faq/memorandum>. Amended 40 times, with the latest update in 2017, the Paris MoU covers 17 international maritime instruments, including MARPOL, with each national authority applying the instruments to which the state is party. A ship that has had multiple detentions may be refused port entry.

106 MARPOL, *supra* note 10, art 2(2).

107 *Ibid*, art 2(3)(a).

108 *Ibid*, annex VI, c III, regs 12–16, 18. Of course, some of these substances are also GHGs. Nitrous oxide, for example, is one of the six gases controlled under the UN climate regime, and some ozone-depleting substances controlled under the Montreal Protocol also contribute to climate change.

109 *Ibid*, annex VI, c IV.

110 For example, through the Global Maritime Energy Efficiency Partnerships (GloMEEP) technical assistance project, supported by the IMO in cooperation with the Global Environmental Facility and United Nations Development Programme to support subscription and implementation of energy efficiency measures in shipping and thus reduce GHG emissions. The participating countries are Argentina, China, Georgia, India, Jamaica, Malaysia, Morocco, Panama, Philippines and South Africa. GloMEEP, online: <<http://glomeep.imo.org/>>. Also relevant is the Global MTCC Network (GMN): Capacity Building for Climate Mitigation in the Maritime Shipping Industry, funded by the European Union and executed by the IMO, promoting networking of marine technology centres to promote energy efficiency in shipping and whose main beneficiaries are developing countries and especially LDC and SIDS states. GMN, online: <<http://gmn.imo.org/about-gmn/>>. Recently, a memorandum of understanding to establish the Global Maritime Technology Centre Network, linking centres in Africa, Asia, the Caribbean, Latin America and the Pacific, was adopted at the IMO. See “IMO Rolls Out Global Maritime Technology Cooperation Centre Network” (4 December 2017), online: IMO <www.marinelink.com/news/cooperation-technology431795?utm_source=MT-ENews-2017-12-05&utm_medium=email&utm_campaign=MT-ENews>.

111 As of January 1, 2020, the global sulphur cap in fuel content will be lowered from 3.5 percent m/m to 0.50 percent m/m. See IMO, Press Briefing, “IMO sets 2020 date for ships to comply with low sulphur fuel oil requirement” (28 October 2016), online: IMO <www.imo.org>. As of January 1, 2015, this cap had already been lowered to 0.10 percent for ECAs.

112 MARPOL, *supra* note 10, annex VI, c III and App III; 2013 *Guidelines for the Designation of Special Areas under MARPOL*, IMO Doc A28/Res.1087 (21 February 2014) at para 3.

113 MARPOL *supra* note 10, annex VI, c I, reg 2(8).

particular sources of pollution.¹¹⁴ In practice, and for the purposes of this report, although not all IMO member states are parties to Annex VI, the annex applies to state parties representing the bulk of global tonnage. It is conceivable that tonnage may be moved to registers of non-state parties, but, as observed earlier, those ships will still be subject to port-state inspections enforcing Annex VI standards in foreign ports.

WTO Rules

While it is unclear to what extent the rules of world trade could potentially have a bearing on aspects of the discourse on the regulation of GHG in international shipping, it is appropriate to provide a brief overview of the topic, as some IMO member states have flagged a potential relationship between prospective MBMs in shipping and WTO rules. In responding to a request for clarification by the IMO Council, the WTO Secretariat identified several rules in the General Agreement on Tariffs and Trade, 1947/1994 (GATT 1994),¹¹⁵ the Agreement on Technical Barriers to Trade, 1994 (TBT),¹¹⁶ and General Agreement on Trade in Services, 1994 (GATS),¹¹⁷ that may be taken into account in the discourse on MBM.¹¹⁸

GATT rules that appear to be relevant for MBMs include: general most-favoured nation treatment (MFN); national treatment on internal taxation and regulation; freedom of transit; non-discriminatory administration of quantitative restrictions (article XIII); and general exceptions (article XX). As a key principle in trade law, the MFN principle is not only in the GATT¹¹⁹ but is to be found also in the TBT¹²⁰ and GATS¹²¹ agreements. It prescribes non-discrimination between like products and services from different trading partners. The GATT national treatment principle prohibits tax or charge discrimination between domestic and foreign

products, and stipulates that foreign products should not be provided with less favourable treatment than domestic products (i.e., a measure that modifies the conditions of competition to the detriment of an imported product).¹²² Freedom of transit entails passage through the territory of WTO members, without discrimination with respect to flag or origin, and including no less favourable treatment in relation to charges, regulations and formalities.¹²³ This amounts to identical levels of access and equal conditions during transit.¹²⁴

The GATT permits exceptions, which could serve to justify an MBM that might otherwise be found in violation of the MFN and national treatment principles.¹²⁵ These include measures “necessary to protect human, animal or plant life or health”¹²⁶ and measures “relating to the conservation of exhaustible natural resources, if such measures are made effective in conjunction with restrictions on domestic production or consumption.”¹²⁷ If a measure is captured under either of those specific exceptions, it can be justified, provided that it is not “applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail, or a disguised restriction on international trade.”¹²⁸

The TBT Agreement has many underlying principles in common with the GATT 1994, but it is less stringent, and its articles contain several built-in exceptions. The three relevant obligations under the agreement are described in brief. They comprise a non-discrimination obligation closely resembling those found in the GATT; a requirement that technical regulations “not create unnecessary barriers to trade or be more trade restrictive than necessary to fulfill a legitimate objective”; and a requirement that domestic standards mirror international ones wherever international standards are present.¹²⁹

It is noted that unlike significant portions of air transport, maritime transport services are not excluded from the scope of GATS. Further,

114 LOSC, *supra* note 9, arts 192, 194, 197.

115 *General Agreement on Tariffs and Trade*, 30 October 1947, 55 UNTS 194, TIAS 1700 (entered into force 1 January 1948), followed by *General Agreement on Tariffs and Trade*, 15 April 1994, 1867 UNTS 187, 33 ILM 1153 (entered into force 1 January 1995) [GATT 1994].

116 TBT, *supra* note 11.

117 GATS, *supra* note 11.

118 *World Trade Organization's Views on Document MEPC 64/5/4 Submitted by India and Saudi Arabia*, Note by the Secretary-General, IMO Doc MEPC 65/INF.18 (21 February 2013), annex [MEPC 65/INF.18].

119 GATT 1994, *supra* note 115, art I.

120 TBT, *supra* note 11, art 2.

121 GATS, *supra* note 11, art II.

122 GATT 1994, *supra* note 115, art III.

123 *Ibid*, art V.

124 MEPC 65/INF.18, *supra* note 118, annex at 3.

125 GATT 1994, *supra* note 115, art XX.

126 *Ibid*, art XX(b).

127 *Ibid*, art XX(g).

128 MEPC 65/INF.18, *supra* note 118, annex at 3.

129 *Ibid*, annex at 5–6; TBT, *supra* note 11, arts 2.1, 2.2, 2.4.

GATS has a broad application covering measures that directly govern the supply of services, as well as those designed to govern other areas but that nevertheless affect trade in services peripherally.¹³⁰ Relevant GATS provisions include MFN treatment,¹³¹ national treatment,¹³² market access¹³³ and additional commitments.¹³⁴ Unlike GATT, GATS allows members to unilaterally opt out of certain provisions by attaching a list of exemptions as a special schedule to the agreement. This opt-out mechanism applies to the MFN, national treatment and market access provisions in GATS. The additional commitments provision allows further customization of the agreement for member states.¹³⁵ It should also be noted that GATS includes an exception provision identical to that found in GATT, namely “necessary to protect human, animal or plant life or health,” and is subject to a similar test.¹³⁶

Maritime transport services are temporarily subject to different treatment under GATS, given that negotiations are still under way. Accordingly, the four relevant provisions of GATS are inoperative until negotiations have concluded. Members are free to undertake their own commitments in the meantime, but they will be allowed to withdraw or revise these commitments up to 60 days before the close of negotiations. They must also finalize their unique exemptions by that time. Finally, no members are permitted to adopt any measures affecting trade in maritime services while negotiations are ongoing, unless those measures are in response to other measures adopted by other nations and are adopted with a view to maintaining or improving the freedom of maritime services. Further, no measures that would improve a member’s “negotiating position and leverage” are permitted.¹³⁷

A recent study by James Bacchus has observed that the regulation of the response to climate change and world trade have proceeded predominantly in silos, with no consideration of issues of consistency

between the two regimes.¹³⁸ Reporting primarily with respect to the WTO rules and dispute settlement procedures applicable to international trade in goods and the potential relationship to national measures adopted in response to climate change, the study observed that the two regimes appear to be headed toward a collision.¹³⁹ This would occur where a Paris Agreement state party and WTO member adopts a climate response measure that potentially conflicts with the MFN clause. As noted earlier, under the Paris Agreement, state parties will make NDCs and it appears that 45 percent of these could consist of trade measures likely to be based on process and production.¹⁴⁰ It is arguable that a similar concern could arise with respect to services that, while governed by the GATS, are subject to analogous principles. Bacchus further comments that in the case of inconsistencies between the two regimes, such as where a trade dispute arises, the WTO rules and dispute settlement procedure are binding on the WTO member state. This is to be contrasted to the NDCs under the Paris Agreement, which are voluntary, and the absence of a dispute settlement system under that agreement. To avoid looming conflicts, and in the absence of a carbon adjustment measure, the study makes a compelling argument that WTO member states should consider adopting a climate waiver to the regime’s rules.¹⁴¹ Clearly, this study and others¹⁴² call for integration, or perhaps better coordination, between the two regimes, and argue that conflict between the two regimes with respect to international shipping, if it arises, should not stand in the way of a fair contribution of the sector to GHG emissions reductions.

130 MEPC 65/INF.18, *supra* note 118, annex at 6.

131 GATS, *supra* note 11, art II.

132 *Ibid*, art XVII.

133 *Ibid*, art XVI.

134 *Ibid*, art XVIII at 6.

135 MEPC 65/INF.18, *supra* note 118, annex at 6–7.

136 *Ibid*, annex at 8; GATS, *supra* note 11, art XIV(b).

137 MEPC 65/INF.18, *supra* note 118, annex at 7–8. See also *Decision on Maritime Transport Services*, GATS Council for Trade in Services Decision S/L/24 (3 July 1996).

138 James Bacchus, “The Case for a WTO Climate Waiver” CIGI, Special Report, 2 November 2017 at 1.

139 *Ibid*.

140 *Ibid* at 2.

141 *Ibid* at 20ff.

142 María Pía Carazo & Daniel Klein, “Chapter 23: Implications for Public International Law Initial Considerations” in Klein et al, *supra* note 26 at 383.

EU Regulation of GHGs

A longstanding fear of shipping industry operators has been the prospect of having to cope with a variety of different unilateral national or regional mechanisms for GHG reduction in the sector. Such an approach, according to an industry view, would fly in the face of the aspiration of uniformity in maritime regulation, potentially throwing international shipping into disarray, and distorting trade and world markets.¹⁴³ The European Union has worked for some time to advance the debate on global regulations for the reduction of GHG emissions from shipping. It has also exerted pressure on the IMO to progress with its deliberations on GHG reduction in the sector. The progress in the IMO has been perceived as being too slow. Convinced that pressure on the IMO is needed to encourage progress, the European Parliament has recently suggested incorporating shipping into the European Union's existing land-based emissions trading scheme (ETS). In turn, this initiative has raised significant concern at the IMO, especially because the concerned parties feared this could undermine efforts to establish a global solution for reducing GHG emissions from international shipping.¹⁴⁴

A European Commission communication issued in 2013 starts out by indicating a strong preference for global regulations to address GHG emissions from international shipping. The European Commission then proceeds to propose a systematic and gradual three-step approach for integrating maritime GHG emissions into the European Union's existing commitments.¹⁴⁵ The first step involved the creation of an emissions monitoring, reporting and verification (MRV) system for ships using EU ports. The second step foresaw the creation of reduction targets in the maritime sector. The third step contemplated the eventual introduction of some

form of MBM.¹⁴⁶ At the same time, and on different occasions since then, EU institutions have indicated a preference that the IMO be the body to set targets and to adopt measures for the maritime sector.

The purpose of the MRV system is to provide reliable data on vessel emissions that can be tracked and used to assess operator contributions. While bunker delivery notes tracking individual vessel fuel consumption were already being issued in 2013, at the time there existed no mechanism for reporting or verification. This was essential to combat fraud and increase accessibility of information, while not placing an unreasonable burden on operators. The European Commission thus sought to introduce a regional system as a pilot project that could be tweaked and eventually projected onto the global stage.¹⁴⁷ In addition, it could facilitate integration into the carbon market, should international shipping either be integrated into the EU carbon market or a dedicated MBM be developed for the sector.

The EU MRV system covers all ships over 5,000 gross tonnage (GT) calling at EU ports, including those in Norway and Iceland.¹⁴⁸ Operators of such ships are required to submit their own monitoring plans for approval before the first year-long emissions reporting period¹⁴⁹ beginning in 2018.¹⁵⁰ These monitoring plans will take into account types of fuel used and must contain a mechanism for tracking consumption.¹⁵¹ Data from each reporting period will be published by the commission in June of each year.¹⁵² Vessels making fewer than 300 voyages during each reporting period are required to submit a single aggregate report, with detailed information on each voyage undertaken during the year. Vessels making more than 300 voyages during a reporting period are permitted to submit a simplified report, provided they visit only EU ports.¹⁵³ All emission reports must be approved by an accredited verifier¹⁵⁴ before they are submitted to the European Commission in April of each year,

143 See the remarks of Simon Bennett, International Chamber of Shipping (ICS) Director of Policy and External Relations, quoted in Jonathan Saul, "Shipping Faces Threat from EU of Unilateral Levy on Carbon Emissions", *Reuters* (21 December 2016), online: <<https://uk.reuters.com/article/us-climate-shipping-eu-idUKKBN14A15T>>.

144 IMO, Press Briefing, "IMO Secretary-General Speaks Out against Regional Emission Trading System" (9 January 2017), online: IMO <www.imo.org/en/MediaCentre/PressBriefings/Pages/3-SG-emissions.asp>.

145 EC, Commission, *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Integrating maritime transport emissions in the EU's greenhouse gas reduction policies*, COM (2013) 479 final (28 June 2013).

146 *Ibid* at 4–5.

147 *Ibid* at 5–6.

148 EC, *Regulation (EU) 2015/757 of the European Parliament and of the Council of 29 April 2015 on the monitoring, reporting and verification of carbon dioxide emissions from maritime transport, and amending Directive 2009/16/EC*, [2015] OJ, L 123/55, art 1.1 [EU MRV].

149 *Ibid*, art 6.1.

150 *Ibid*, art 8.

151 *Ibid*, arts 6.3(f), 6.3(g).

152 *Ibid*, art 21.

153 *Ibid*, art 9.2.

154 *Ibid*, arts 13–16.

via a dedicated online information system that became operational in July 2017.¹⁵⁵ Beginning in 2019, all participating vessels will be required to carry on board a document of compliance.¹⁵⁶

The MRV implementation appears to be making good progress, which bodes well for the eventual adoption of a similar system at the global level that would be administered by the IMO. Some industry players, however, remain skeptical about the feasibility of the MRV, in particular with regard to the verification mechanism.¹⁵⁷ There are concerns that the EU MRV, which is more demanding in terms of data recording and reporting than current IMO requirements, will run parallel to the IMO system, thus causing unnecessary duplication. Whether the EU initiatives will be embraced in whole or in part by the IMO, and despite the peer pressure exerted on the organization, the MRV system should be considered a useful pilot project that will aid IMO efforts in developing an effective and transparent monitoring system for GHG emissions. The European Union certainly has expressed readiness to consider the appropriateness of an alignment of the EU MRV to the IMO model once the latter is adopted. Since the adoption of the IMO Data Collection System for emissions from ships and of the remaining guidelines on functioning of the system in July 2017, the European Commission has started work on the comparison of the two systems with a view of alignment, as foreseen in the EU MRV Regulation. The commission is expected to adopt a proposal in 2018, which will then be considered by the European Parliament and the Council.

Looking to the second and third steps of its proposed approach depicted in 2013 by the European Commission, and using the opportunity of the revision of the ETS directive, a proposal to the European Parliament envisaged the incorporation of shipping to and from EU ports into an arrangement for a Maritime Climate Fund (as a modification to the existing ETS Directive) by 2023, if the IMO does not adopt a “comparable

system” by 2021.¹⁵⁸ In its amendment, Parliament recognized that the existing ETS is the primary tool for achieving long-term climate and energy targets, but that this tool must be “complemented by *equivalent* additional actions taken in other legal acts and instruments dealing with greenhouse gas emissions from sectors not covered [under it].”¹⁵⁹ It was implied that the IMO, as a key body responsible for one of those sectors, was expected to adopt effective measures in a timely manner.¹⁶⁰

Assuming no “comparable system” to the ETS is developed by the IMO by 2021, the European Union proposed to determine an allowance for the maritime sector in line with other land-based continental sectors by August 1 of that year. This allowance would then be added to the total EU quota, thus gradually integrating shipping trading in EU ports into the emissions allowance auctions. Of the revenues generated from such auctions, 20 percent would be allocated to a Maritime Climate Fund, the purpose of which would be enhancement of in-sector technological and operational innovation with an eye to reducing CO₂ emissions. The EU scheme contemplated the eventual adoption of some form of international agreement regulating GHG emissions in the maritime sector, at which point “amendments in to ensure alignment with [such an] agreement” will be proposed, considered and voted upon.¹⁶¹

It is difficult to assess the substance of the proposed ETS on shipping, for a variety of reasons. The proposal was cast in general terms and contained no specific emissions allowance for shipping, but merely a broad statement that one would be set in accordance with other sectors. Its 20 percent revenue allocation to a Maritime Climate Fund appeared to be borrowed from proposals discussed at the MEPC. Thus, the only assessment of including shipping in the ETS would have been a comparative assessment with other sectors.

¹⁵⁵ *Ibid*, arts 11, 12.

¹⁵⁶ *Ibid*, arts 11, 17, 18.

¹⁵⁷ See statement of ICS Chairman Esben Poulsen in ICS, Press Release, “EU Must Align Shipping CO₂ Rules with International Community, Says ICS” (6 June 2016), online: ICS <www.ics-shipping.org>.

¹⁵⁸ EC, *On the proposal for a directive of the European Parliament and of the Council amending Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments (COM(2015)0337 – C8-0190/2015 – 2015/0148(COD))*, [2017] OJ, Annex 8-0003/2017 [Proposal to Amend Directive 2003/87/EC], amendment 36 [Amendment 36].

¹⁵⁹ Amendment 36, *ibid* [emphasis added].

¹⁶⁰ In comparison, CO₂ emissions from aviation have been part of the EU ETS since 2012, but with limited application to flights within the European Economic Area until 2016 to support the development of an ICAO global MBM, which has now been adopted in the form of CORSIA. All airlines are required to monitor, report and verify their emissions. EC, Commission, “Reducing Emissions from Aviation” (21 November 2017), online: EC <https://ec.europa.eu/clima/policies/transport/aviation_en>.

¹⁶¹ Amendment 36, *supra* note 158.

Unsurprisingly, the IMO's and shipping industry's responses have been critical of the EU initiative for the reasons already touched upon.¹⁶² There was even concern expressed in the European Parliament, albeit by a minority, that the proposed measures would encroach upon the mandate of the IMO.¹⁶³ The proposed amendment was not accepted by the Council, but the underlying concerns appear to have been taken on board.¹⁶⁴ Following tripartite negotiations involving the European Parliament, the Council, and the European Commission, a compromise text was proposed as a recital in the amended ETS Directive, providing that action either at the IMO or European Union should start from 2023, including the preparatory work on adoption and implementation of emissions reduction measures.

Effectively, the European Union appears to be expressing some degree of deference to continued IMO efforts in pursuing its road map, but leaves open the possibility of EU regional action if progress at the IMO is deemed insufficient in the next few years. In this respect, it is relevant to acknowledge that the European Union, to be able to deliver on its commitments under the UNFCCC, depends on aviation and shipping to deliver. If somehow these sectors would be less involved in the realization of the necessary reduction of emissions, other industries within the European Union would be faced with a situation that they have to compensate and do more. These other industries will pressure the EU institutions to take action, knowing there is much more that can be done cost effectively to reduce GHG emissions from shipping.

¹⁶² Andrew Spurrier, "European Parliament Votes to Bring Shipping into EU Emissions Trading Scheme", *Fairplay* (15 February 2017), online: Fairplay <www.fairplay.ihs.com>.

¹⁶³ *Proposal to Amend Directive 2003/87/EC*, *supra* note 158, Minority Opinion.

¹⁶⁴ "Threat of Shipping's Inclusion in EU Emissions Trading Scheme Recedes", *Seatrade Maritime News* (10 November 2017), online: Seatrade <www.seatrade-maritime.com/news/europe/threat-of-shipping-s-inclusion-in-eu-emissions-trading-scheme-recedes.html>.



THE CHALLENGE OF REGULATING GHG EMISSIONS FROM INTERNATIONAL SHIPPING

How, why and in what respects is the governance of international shipping different from other industries, and with what significance for determining mitigation contributions? The answers help to explain why the task of developing the international shipping industry's contribution to the global response to climate change was not directly addressed by the Paris Agreement and deferred to the IMO as the competent international organization on the matter. The questions further provide insights into the *problématique* of maritime regulation and the issues that will need to be navigated by the IMO in developing an appropriate regulatory approach to GHG emissions.

Commercial and Operational Life of the Ship

The diversity of actors involved in the operational life of a ship poses challenges in distributing the load of emissions reductions. A ship's energy use and efficiency starts with its construction to standards designed to achieve cargo-carrying capacity, optimal fuel use and emissions outcomes. Construction of a new ship will be guided by international rules and standards applicable to its class, including prospective standards with effectiveness at a later date, as well as market demand and finance.¹⁶⁵ The duration of a ship mortgage will vary and will usually have lengthy amortization periods followed by a balloon payment.¹⁶⁶ Thus, to meet new energy use and efficiency standards, a new build will have to consider mortgage costs in addition to crewing, operations, maintenance, insurance and other expenditures. Moreover, during the ship's life cycle it is likely that newer equipment standards will have to be implemented, requiring retrofitting and incurring new mortgage costs. A shipowner will tend to take actions to optimize the earning capacity of the ship throughout its life, or at least during its ownership, until its withdrawal from service and eventual recycling.

¹⁶⁵ See Aldo Chircop et al, eds, *Canadian Maritime Law*, 2nd ed (Toronto: Irwin Law, 2016) at 288ff.

¹⁶⁶ OECD Council Working Party on Shipbuilding (WP6), Report on Ship Financing, "Average loan amortization profiles are approximately 15 to 18 years for a new vessel and loan tenors are typically 8 to 10 years for a new vessel, leaving borrowers with a balloon repayment that must be refinanced at the maturity of the initial loan" (June 2007) at 7 [OECD 2007], online: OECD <www.oecd.org>.

The ship is composed of a cluster of technologies relevant for air pollution and GHG regulation.¹⁶⁷ The hull will have a hydrodynamic design to maximize the use of its propulsion and energy savings. The propulsion machinery and propeller will vary and will potentially be operable, with modifications, to use different types of fuels. The propeller itself will be engineered to overcome resistance and generate adequate thrust. From an operational perspective, the higher the speed employed to expedite the movement of the vessel, the greater the fuel consumption. Some ships will have scrubbers to help filter particularly harmful emissions, such as particulate matter. The master, officers and crew will be trained and certified in accordance with international standards to navigate the ship in a safe, environmentally responsible and economically efficient manner.

Ships cannot all be regulated in the same manner. There is a wide variety of classes of ships to service a range of general and specialized trades or to perform specialized functions and services.¹⁶⁸ Each type of ship is classed separately, and while there are safety and environmental rules of general application, there are also requirements specific to the type of ship and its operations. For example, not all ships are able to perform safely and as intended simply by reducing speed or changing fuel. A ship needs to maintain a minimum speed, depending on its class, purpose and navigational conditions, to ensure manoeuvrability, engine considerations and safe operation. While low speed results in lower emissions per ton mile (amount of cargo carried by mile),¹⁶⁹ the consequence is longer voyages and, in turn, more ships or voyages by the same ship to carry the cargo of the trade route concerned. Another concern of slow speed in a voyage charterparty is that it might militate against early arrival in a congested port to factor potential waiting times for a berth. The carrier will have contractual obligations to arrive and discharge cargo in the specified time (called “lay time”); exceeding lay time results in demurrage (liquidated damages for exceeding lay time). In practice, these risks would likely be addressed

167 For an overview of the technology of shipping, see Chircop et al, *supra* note 165 at 18–58.

168 *Ibid* at 82–95.

169 For a cost-benefit analysis of the use of speed to control emissions, see Jasper Faber et al, *Regulated Slow Steaming in Maritime Transport: An Assessment of Options, Costs and Benefits* (Delft: CE Delft, 2012), online: CE Delft <www.transportenvironment.org/sites/te/files/media/Slow%20steaming%20CE%20Delft%20final.pdf>.

by industry model clauses (for example, virtual arrival clause¹⁷⁰) or adjustment of contract terms.¹⁷¹

Opportunities to control emissions may not necessarily be in the owner’s control. The ship may be operated by a management company or perhaps even chartered. Indeed, a vessel may be chartered and further sub-chartered. On a bareboat charter, the owner parts with possession and control of the ship (without passing title) and the charterer is responsible for hiring the crew, operating the vessel, insuring it and securing its necessities, including bunkers. Thus, it is often the responsibility of the charterer to operate the vessel in an environmentally efficient manner and the charterer is responsible for securing cargo to earn freight, purchasing fuel, operating it at various speeds and ultimately producing emissions. A charterer, whether bareboat or on-time charter (lease of a ship for a specific period), will want to maximize the earning power of the ship by contracting as many voyages as possible. Speed is an important consideration and fewer cargo runs for a ship may reduce the value of its time charter.

The typical ship used for international shipping is an instrument of international trade. It remains in business as long as it services maritime trade. The extent of the fleet, ship composition and size are all factors determined by the current or expected volume of global and regional trade. Over the course of the 20- to 25-year average life span of a ship, market and technological factors intervene to determine how that ship is managed. The downturn of various trades in recent years saw many ships, including container vessels, sent to recycling well in advance of the average life span. Their operation was no longer commercially viable.¹⁷² A ship remains in business and recovers its costs if its shipowner, operator or charterer secure cargo for carriage on a frequent, if not continuous, basis. Cargo brokerage, another aspect

170 INTERTANKO and OCIMF, *Virtual Arrival: Optimising Voyage Management and Reducing Vessel Emissions – An Emissions Management Framework* (London, UK: OCIMF, 2010), online: INTERTANKO <www.intertanko.com/upload/virtualarrival/virtualarrivalinformationpaper.pdf>. Virtual arrival is defined as “[A] process that involves an agreement to reduce a vessel’s speed on voyage to meet a Required Time of Arrival when there is a known delay at the discharge port” (*ibid*). BIMCO has a similar Virtual Arrival Clause for Voyage Charter Parties, online: BIMCO <www.bimco.org/contracts-and-clauses/bimco-clauses>.

171 For a discussion on charterparty clauses, see Erik Røsæg, “A System for Queuing in Ports” (SSRN 2009), online: <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1697404>.

172 “With Scrapping Rates on the Up, Containership Owners Weigh Anchors in Lay-up”, *The Loadstar* (17 January 2017), online: <<https://theloadstar.co.uk/scrapping-rates-containership-owners-weigh-anchors-lay/>>.

of the international shipping industry, plays an important role in supplying business. Often, the carriage of goods by sea is simply one leg of a multimodal voyage. Hence the emissions for the ton mile may include other forms of transportation such as road and rail, as well as carriage on board other vessels providing feeder services to regional and smaller ports. The contract of carriage integrates the various modes into a unified service. Contemporary transport is largely guided by just-in-time delivery to reduce warehousing costs. The ship itself performs the function of a floating warehouse. Indeed, cargo may be sold at sea, perhaps more than once, and its delivery may be directed to different ports where the consignees (buyers) are located. Hence, the operators of ships will value flexibility to maximize use of their ships in the service of trade between states.

Not all ships are engaged in maritime trade and the carriage of passengers by sea. The wide variety of classes of ships mentioned earlier includes other vessels that service shipping generally, as well as other specialized services to maintain navigation aids and support other ocean uses such as aquaculture, the offshore oil and gas industry, and wind farms. These vessels may consume more fuel per mile than other ships because they are workhorses of the industries they service, such as offshore service vessels that depend on high torque power. In general, while ships provide trade and specialized services, they also receive a range of other services from supporting vessels and ports. Some of these vessels may not be engaged in international shipping. Thus, there is a wide range of international and domestic shipping emission sources.

All ships are subject to construction, equipping, crewing, and fuel standards and rules. These include not only those adopted by the IMO, but also those adopted at the national level and sometimes at the subnational level.¹⁷³ There are usually requirements at the industry level as well. For example, independent classification societies, which play a critical role in ensuring that ships are built, equipped and operated according to international standards, also have class rules.

173 For example, in California: with respect to sulphur emissions, *Fuel Sulfur and Other Operational Requirements for Ocean-Going Vessels within California Waters and 24 Nautical Miles of the California Baseline*, 13 CCR § 2299.2; with respect to vessels calling into state ports, *Biofouling Management Regulations to Minimize the Transfer of Nonindigenous Species from Vessels Arriving at California Ports California*, 2 CCR § 2298.1ff.

There are several such societies, the major ones being members of the International Association of Classification Societies (IACS), and from time to time member associations produce and update unified requirements.¹⁷⁴ These are vital because they frequently provide the necessary level of detail (i.e., harmonized definitions), which the original IMO rule or standard might not possess or upon which an IMO rule depends.

All ships currently require bunkers for their operation, although the types of fuel used vary substantially according to IMO standards, class rules and expected operations. The bunker industry is yet another aspect of the international shipping industry. There is a complex multi-party production chain leading to the availability of bunker fuel. The bunker industry relies on the refining industry to produce the wide range of fuels needed, including heavy bunker C (tar like), a range of heavy and light diesels, biodiesels, liquefied natural gas (LNG) and so on. In turn, refineries rely on oil and gas producers from developed and developing countries. Not all refineries are equipped to produce the wide range of fuels needed by the bunker industry. Refineries receive heavy to light crudes and process these according to their capacities. It has been reported that LNG, modified diesel and biodiesel could cost respectively 20 percent, 70 percent and 480 percent more than regular low-cost bunker fuel.¹⁷⁵ A recent report indicates that the LNG bunkering market, although facing infrastructure challenges, is expected to grow exponentially as a low-cost alternative to reducing shipping's carbon and air emissions footprint, and in particular to meet sulphur emissions requirements by 2020.¹⁷⁶ While LNG is an increasingly popular fuel of choice for these reasons, there are concerns. First, infrastructural challenges restrict the trade of LNG-powered ships to ports where LNG is in supply. Second, there is risk that LNG-powered ships could become stranded assets as decarbonization efforts are ratcheted up. Third, LNG is associated with methane leakages into the atmosphere from

174 See e.g. *Requirements Concerning Polar Class*, IACS Req. 2016 [Requirements Concerning Polar Class], online: IACS <www.iacs.org.uk/media/3780/ur_i_pdf410.pdf>.

175 Pew Centre on Global Climate Change, "Marine Shipping" (March 2010), online: Centre for Climate and Energy Solutions <http://research3.fit.edu/sealevelriselibrary/documents/doc_mgr/483/Global_Marine_Shipping_Emission_Mitigation_-_Pew_Center_2010.pdf>.

176 "LNG Bunkering to Grow at CAGR of 62.5% to reach USD 24.684 bln in 2023", *Marine Link* (3 November 2017), online: Marine Link <www.marinelink.com/news/bunkering-reach-grow430960>.

venting, leakage and slippage.¹⁷⁷ This is worrisome, as methane is a far more powerful GHG than CO₂, potentially undermining general efforts to reduce GHG emissions from international shipping. In any case, LNG should be considered a transitional fuel on the road toward decarbonization.

A further point concerning bunkers is that historically the maritime sector (as well as aviation) has benefited from tax-free fuels and frequently also other privileges, such as no excise taxes, turnover taxes, value-added tax and low corporate tax rates.¹⁷⁸ This privileged fiscal status has been explained “in large measure from these sectors’ international status: they do not naturally belong to any one particular country. Nor are they part of any international agreements that limit taxation in aviation or extreme tax competition in shipping.”¹⁷⁹ Further explanation includes the high risk undertaking to provide shipping services and their essential role in global logistics and supply chains.

Mobility of the Ship

Ships are very mobile property, both as instruments of trade and as objects of trade themselves. Ships have the nationality of the state where they are registered. While there are several states that own national shipping companies, the majority of commercial ship ownership is private and structured in a manner to facilitate its finance and risk distribution. Ownership is divided into shares, each one of which may have multiple owners. In traditional registers, the ship must be beneficially owned in the state of registration. In contrast, in open registers (also known as flags of convenience), ownership may be held by foreign interests. The registration of the ship may be changed with ease so that over the course of their lives, and until deregistration for recycling, most ships will have had different nationalities.¹⁸⁰ Registration usually changes because of change of ownership, a ship has been chartered, or an owner’s desire to cut down costs. Crewing cost savings feature prominently because open registers permit the hiring of international crews; however, other cost-saving

incentives play a role as well, such as expenditures incurred in complying with flag state regulations and taxation. Accordingly, a ship may be owned by interests in one or more states, uses another state as a base or is operated from it, and services the trade of other states around the world without necessarily ever calling into the port of registry.

While servicing international trade, a ship will traverse ocean spaces subject to the jurisdiction of other states and call into numerous foreign ports. In between, it will navigate the high seas. The mobility of ships has long been protected as the traditional freedom of navigation, which emerged early in the international law of the sea and today remains one of the most protected (and regulated) ocean uses. The freedom of navigation consists of a cluster of international navigation rights depending on the marine space traversed, such as innocent passage through the territorial sea¹⁸¹ and archipelagic waters,¹⁸² archipelagic sea lanes passage in archipelagic waters,¹⁸³ transit passage through straits used for international navigation,¹⁸⁴ and the freedom of navigation in the exclusive economic zone and on the high seas.¹⁸⁵ Accordingly, in the interests not only of unimpeded international regulation, but also maritime trade, it is considered essential that the rules and standards for ships and their operations be global in nature and application. When desirable, regional rules that find general acceptance tend to concern specific considerations to a particular geographical area, such as load line requirements for particular trading regions.¹⁸⁶ The rules for a region may also be set in an IMO maritime convention.¹⁸⁷ If individual states or states at the regional level were to adopt rules for emissions from international shipping outside of the IMO, there could be adverse consequences for the general expectations of universality and uniformity of international maritime regulation, the protection of international

¹⁷⁷ *Methane Emission from LNG Carriers*, Submitted by the Republic of Korea, IMO Doc MEPC 71/INF.23 (28 April 2017).

¹⁷⁸ Jon Strand, “Fuel charges in International Aviation and Shipping: How High; How; and Why?” (17 April 2013) *Let’s Talk Development* (blog), online: World Bank <<http://blogs.worldbank.org/developmenttalk/fuel-charges-in-international-aviation-and-shipping-how-high-how-and-why>>.

¹⁷⁹ *Ibid.*

¹⁸⁰ Chircop et al, *supra* note 165 at 322–28.

¹⁸¹ LOSC, *supra* note 9, art 17.

¹⁸² *Ibid.*, art 52.

¹⁸³ *Ibid.*, art 53.

¹⁸⁴ *Ibid.*, art 38.

¹⁸⁵ *Ibid.*, arts 58, 87.

¹⁸⁶ *International Convention on Load Lines*, 5 April 1966, 640 UNTS 133, art 25 (entered into force 21 July 1968). Special regional rules on ship load lines have to be communicated to the IMO for circulation among other state parties.

¹⁸⁷ Such as the rules for and emission control areas under MARPOL, *supra* note 10, annex VI, c 1, reg 2(8).

navigation rights, and potentially the availability of shipping to service maritime trade.¹⁸⁸

Governance of International Shipping

In addition to the global and transnational nature of international shipping, a further justification for the IMO's development of the industry's contribution to climate change response is its competence and work record. Based in London, United Kingdom, the organization was conceived by an international convention in 1948 as an intergovernmental technical consultative organization¹⁸⁹ and first convened in 1959, a year after that instrument entered into force. Since then its mandate has evolved substantially as an international regulatory body.¹⁹⁰ Although the IMO is not the only international organization with competence in shipping matters, it is widely recognized as the leading body for the regulation of international shipping.¹⁹¹ At the time of writing, the IMO has 172 member states and three associate members, representing 97.28 percent of global tonnage.¹⁹²

The LOSC designates the IMO as the competent international organization with respect to international shipping in numerous provisions.¹⁹³ Its core mandate is more fully set out in its constitutive instrument as the provision of “machinery for co-operation among Governments in the field of governmental regulation and practices relating to technical matters of all kinds affecting shipping engaged in international trade” and “to

encourage and facilitate the general adoption of the highest practicable standards in matters concerning the maritime safety, efficiency of navigation and prevention and control of marine pollution from ships.”¹⁹⁴ The IMO is responsible for more than 50 conventions and agreements, and the number of subsidiary instruments it has adopted (codes, recommendations, guidelines and other instructions) exceeds 160,¹⁹⁵ easily making international shipping the most regulated ocean use.

Although GHG regulation is not expressly mentioned in the IMO's constitutive instrument, the powers of the assembly (the organization's highest decision-making structure) include “adoption of regulations and guidelines concerning maritime safety, the prevention and control of marine pollution from ships and other matters concerning the effect of shipping on the marine environment assigned to the Organization by or under international instruments, or amendments to such regulations and guidelines which have been referred to it.”¹⁹⁶ These other instruments include MARPOL, for which the IMO provides, among others, secretariat functions. More broadly, the current strategic plan of the IMO is geared to the pursuit of “sustainable” shipping.¹⁹⁷ An important focus in Strategic Direction 3 aimed at the development of “appropriate solutions to reduce the shipping industry's contribution to air pollution and its impact on climate change” and including the development of “a comprehensive IMO strategy on reduction of greenhouse gas emissions from ships which will be ambitious and realistic.”¹⁹⁸

Meeting biennially, the assembly may recommend to members the adoption of new regulations and guidelines.¹⁹⁹ The secretariat has also provided support in generating and disseminating important information and discussion documents, such as the three studies concerning GHG emissions from ships, considered below. The

188 Aldo Chircop, “The International Maritime Law Response to Climate Change: The Quest for the Shipping Industry's ‘Fair Share’ of GHG Emissions Reduction” in J Guifang Xue & Jie Zheng, eds, *The Law of the Sea and Emerging Issues* (Beijing: China Democracy and Legal System Publishing House, 2018).

189 *Convention on the Inter-Governmental Maritime Consultative Organization*, 6 March 1948, 289 UNTS 3 (entered into force 17 March 1958), as amended and renamed the *Convention on the International Maritime Organization* [IMO Convention].

190 Aldo Chircop, “The International Maritime Organization” in Donald R Rothwell et al, eds, *The Oxford Handbook on the Law of the Sea* (Oxford, UK: Oxford University Press, 2015) 416.

191 Several UN bodies and other organizations have competence in some aspect of shipping, such as UNCTAD with respect to liner conferencing, the UN Commission on International Trade Law in regard to carriage of goods by sea, the World Meteorological Organization in respect of weather forecasts and broadcasting and the International Hydrographic Organization with respect to charting.

192 IMO, “Status of Treaties”, *supra* note 102.

193 See LOSC, *supra* note 9, arts 211.1–211.2, 211.5, 211.7, 217.1–217.4, 218.1, 219, 220.1–220.3, 220.7, 226.1, 228. See also UN, Division for Ocean Affairs and the Law of the Sea Office of Legal Affairs, “‘Competent or Relevant International Organizations’ under the United Nations Convention on the Law of the Sea” in *Law of the Sea Bulletin* No 31 (New York, NY: UN, 1996) at 79–95.

194 IMO Convention, *supra* note 189, art 1(a).

195 *List of Codes, Recommendations, Guidelines and other Environment-related Non-mandatory Instruments*, Note by the Secretariat, IMO Doc 70/INF.7 (10 August 2016).

196 IMO Convention, *supra* note 189, art 15(i).

197 *Strategic Plan for the Organization (2018 to 2023)*, IMO Assembly Resolution A.1110(30), 6 December 2017, IMO Doc A 30/Res.1110 (8 December 2017) [IMO Strategic Plan].

198 *Ibid* at 9.

199 IMO Convention, *supra* note 189, art 15(j). For example, in 1991, the assembly adopted a resolution that, among others, requested the MEPC to consider a range of emission issues. *Prevention of Air Pollution from Ships*, IMO Assembly Resolution A.719(17), 6 November 1991 [Resolution A.719(17)].

IMO Council, the organization's executive body, has also stepped in on the GHG issue as needed. However, the structure directly responsible for the environmental aspects of shipping is the MEPC, established in 1973 following the *Torrey Canyon* casualty in 1967. Its terms of reference encompass regulatory responsibilities assigned by maritime conventions (for example, MARPOL), consideration of enforcement measures, technical assistance and cooperation on marine pollution, and cooperation with other regional and international organizations.²⁰⁰ The MEPC coordinates closely with other IMO structures, including the Maritime Safety Committee (MSC) and Legal Committee. Whenever issues arise that require legal interpretation, the MEPC refers such questions to the Legal Committee. The MEPC and MSC are assisted by a complex system of sub-committees.²⁰¹ On air pollution generally, and the GHG issue, the MEPC has conducted much of the in-depth work through working groups and expert groups that meet both during and in between committee sessions.

While IMO rules and standards may be adopted on majority voting, in practice, decisions are generally adopted by consensus, thus frequently achieving a high degree of support. There have been instances when consensus was not achieved and instead a proposed resolution containing new rules and standards was put to a vote. As will be seen below, this was the case during development and adoption of GHG regulations under MARPOL Annex VI. At times, new regulatory initiatives have been proposed by such organizations. The regulations are adopted and eventually enforced with NMFT for any flag state authority or industry actor expressly recognized by national maritime administrations. After all, flag states and industry actors are engaged in global competition while deriving commercial benefits from international maritime trade.

Since the establishment of the IMO, the process of maritime regulation making has evolved from one characterized by dominant diplomatic processes, under the tight control of member states (and state parties to conventions), to a more inclusive one. In the contemporary setting, the process enables the participation of non-governmental organizations

200 *IMO Convention*, *supra* note 189, art 38.

201 Namely: Sub-Committee on Human Element, Training and Watchkeeping; Sub-Committee on Implementation of IMO Instruments; Sub-Committee on Navigation, Communications and Search and Rescue; Sub-Committee on Pollution Prevention and Response; Sub-Committee on Ship Design and Construction; Sub-Committee on Ship Systems and Equipment; and Sub-Committee on Carriage of Cargoes and Containers.

(NGOs) that are granted consultative status. On the basis of criteria set out in an assembly resolution,²⁰² the council grants consultative status to applicant NGOs that are able to make a substantial contribution to IMO work, usually through the provision of information and expert advice.²⁰³ Consultative status requires an undertaking to support IMO activities and disseminate its work, as well as granting reciprocal privileges to the IMO.²⁰⁴ While organizations with consultative status have no voting power, they enjoy a broad range of participatory privileges, including the ability to submit documentation for consideration in the various structures of the organization, as well as addressing meetings on being recognized by the chair.²⁰⁵ The list of NGOs with consultative status is reviewed periodically and over the years it has grown to include organizations from all sectors of the shipping industry, maritime labour, environmental organizations and other NGOs.

A former chair of the Legal Committee observed that “active industry participation in the work of the committee is evidenced by the presence of a large number of observer delegations representing every sector of the maritime industry,” with these observer organizations “given wide latitude to intervene and contribute to the work of the Committee.”²⁰⁶ There are numerous examples where shipping industry organizations played critical roles in the development of international standards.²⁰⁷ As observed elsewhere in this report, the proposal for a road map for IMO regulation of GHG emissions originated from industry organizations. One view is that “the shipping sector have been shown to be more influential in affecting the views of decision-making state delegations than those representing environmental interests.”²⁰⁸ This has been evident in the development of the Polar Code, in which the instrument's environmental provisions

202 *Rules and Guidelines for Consultative Status of Non-governmental Organizations with the International Maritime Organization, Relations with Non-governmental Organizations*, Note by the Secretary-General, IMO Doc A 28/21 (d) (28 August 2013), annex.

203 *Ibid*, rule 1.

204 *Ibid*, rule 4.

205 *Ibid*, rule 6.

206 Alfred Popp, “The Treaty-Making Work of the Legal Committee of the International Maritime Organization” in A Chircop et al, eds, *The Regulation of International Shipping: International and Comparative Perspectives* (Leiden, Boston: Martinus Nijhoff Publishers, 2012) 209 at 224.

207 See e.g. *Requirements Concerning Polar Class*, *supra* note 174. The IACS polar-class requirements are a basic standard of the Polar Code.

208 MN Tsimplis, “Shipping and the Marine Environment in the 21st Century” in M Clarke, ed, *Maritime Law Evolving: Thirty Years at Southampton* (Oxford, UK: Hart Publishing, 2013) 95 at 107.

were narrowly focused on pollution prevention, whereas environmental NGOs advocated for a broader environmental protection approach so as to include anti-fouling systems and ballast-water concerns in polar waters.²⁰⁹ Similar NGO concerns have been expressed in the deliberations on GHG emissions from ships and, more generally, on transparency in the governance of the IMO.

Regulation theory suggests that tripartism in responsive regulation (that is, involving a public regulating authority, a regulatee and public interest groups) provides for better cooperation and checks on regulatory capture.²¹⁰ In practice, the degree of influence exerted in the IMO by organizations with consultative status may be more nuanced. Delegations of member states are in control, and, while some may include industry representatives, most do not. Perhaps the degree of influence exerted by organizations with consultative status in any IMO structure or process depends on issue sensitivity and willingness of member delegations, or at least some of them. On some environmental issues, such as particularly sensitive sea areas, the contributions of environmental organizations played a key role in informing the development of an international standard.²¹¹

In general, international rules and standards adopted by the IMO apply to ships on international voyages. Indeed, IMO technical regulation generally targets ships rather than states. In exercising effective jurisdiction and control, states are expected to apply international standards developed for ships. The regulation of GHG emissions from international shipping poses the most difficult challenge. Ships also operate on purely domestic trades, known as cabotage, where the ports of departure and destination are in the same state, and also when ships provide services from ports to an offshore activity in waters within the jurisdiction of the same state. The distinction

is important because NDCs under the Paris Agreement capture the latter, but not the former. The consequence is that not all ship emissions will necessarily be addressed by IMO regulation. In addition to cabotage, other potentially excluded vessels include fishing and recreational vessels. However, in other areas of maritime regulation, some states have extended the application of IMO regulation to domestic shipping in the interests of consistent safety, security and environmental regulation. This can again be expected with respect to GHG regulation of ships on domestic trades and, as observed earlier, their emissions can be expected to be captured by NDCs.

Principles and Process of Maritime Regulation

Maritime regulation involves a highly structured and lengthy deliberative process aimed at promoting universality of participation in the maritime conventions and uniform implementation of rules and standards. The process is not necessarily exclusively technical and a degree of politicization of some issues has occurred. As mentioned earlier, in pursuit of global uniformity, the basic policy underlying the application and enforcement of IMO conventions is NMFT in international shipping, whether the institution concerned is a maritime administration or an industry operator. When a maritime administration does not possess the technical capabilities needed to implement international rules and standards, technical assistance is readily available and provided. The usual regulatory process is accompanied by capacity-building analysis.

International maritime regulation is also guided by rationales of compelling necessity, functionality and pragmatism. Regulation serves the need to have the highest practicable standards to ensure and facilitate maritime safety, marine environment protection, security and ultimately the flow of trade. The opening statement of the organization's Strategic Direction 14 provides that "IMO will seek to ensure better regulation through a systematic approach and that its instruments are free from administrative requirements that are disproportionate, obsolete or unnecessary."²¹²

209 See *Environmental Protection in the Polar Code*, Submitted by Friends of the Earth International, World Wide Fund for Nature, Pacific Environment and Clean Shipping Coalition, IMO Doc MEPC 68/INF.37 (6 March 2015).

210 See Ian Ayres & John Braithwaite, "Tripartism: Regulatory Capture and Empowerment" (1991) 16:3 *Law & Soc Inquiry* 435; Melissa Rorie, "Responsive Regulation" in *Oxford Handbooks Online* (New York, NY: Oxford University Press, 2015), online: <<http://dx.doi.org/10.1093/oxfordhb/9780199935383.013.109>>.

211 For example, for an insight into the WWF's influence in amending guidelines on particularly sensitive sea areas, see *Revision of Resolution A.720(17)*, Report of the Drafting Group, IMO Doc MEPC 43/6 (3 December 1998). Other areas where environmental NGOs had substantial influence include anti-fouling systems, underwater noise and individual PSSA designations.

212 *IMO Strategic Plan*, *supra* note 197, SD 14.

In 2015, the IMO Assembly further refined the regulatory process through the adoption of six basic principles to guide regulation making in a systematic manner and to ensure consistency throughout the organization.²¹³ First, the regulation must be necessary, i.e., there is an evidenced, compelling need with respect to the operational, technical and economic impacts and actual benefits derived. The proposed regulation is not or cannot be fully or partially addressed in an existing instrument or by other means. Second, the regulation must be consistent with other existing maritime regulations. For example, the proposed regulation should not contradict or undermine an existing rule or standard. Third, the proposed regulation must be proportionate to the issue addressed. It must be balanced and take into account its direct and indirect impacts. Fourth, the proposed regulation must be fit for the intended purpose so that it produces the expected outcome. Fifth, the proposed regulation must be resilient so that it is able to adapt to technological change and capacities. Sixth, the proposed regulation must be clear. It is to be drafted in simple and unambiguous terms to facilitate its implementation and enforcement. In recent years, the general approach taken in maritime regulation has been goal-based, aimed at achieving a specific outcome rather than solely providing prescriptions for specific standards or conduct. This approach provides the persons addressed by the regulation a measure of flexibility in the process of compliance, while meeting the intended regulatory outcome.

Technical regulation with goal-based standards is further supplemented by standards developed by the International Standards Organization (ISO),²¹⁴ in particular by technical committee ISO/TC 8 focusing on ship and marine technology.²¹⁵ In addition to the establishment of the goal, goal-based regulation includes compliance with functional requirements and verification of conformity. These standards directly or indirectly support the development and implementation of IMO regulations and assist innovation. Standards developed to date include

213 *Principles to be Considered when Drafting IMO Instruments*, IMO Assembly Resolution A.1103(29) (26 November 2015), annex.

214 International Standards Organization, online: ISO <www.iso.org/home.html>.

215 ISO TC 8: *Ships and Marine Technology*, online: ISO <www.iso.org/committee/45776.html>.

vessel efficiency²¹⁶ and standards for general GHG emissions.²¹⁷ The value of ISO standards is that they enhance transparency of key processes, such as reporting and verification, as well as facilitating compliance with IMO regulations.

Each IMO committee has its own guidelines on method of work. For example, the MEPC and MSC have a well-defined process.²¹⁸ Guided by compelling need, the typical process provides for three steps, namely, data gathering on an issue proposed for regulation, analysis of the data gathered, followed by decision making on an appropriate rule and standard, if needed.

Recent submissions to the council have proposed further structuring of the rule-making process to ensure a higher level of scrutiny of the compelling need and appropriateness of the proposed rule and standard.²¹⁹ While the proposed refinements have not been adopted, they are expected to receive further consideration in due course. The proposals suggest that it would be useful to distinguish between: the development of new codes or chapters to an existing convention; amendments to existing instruments; and amendments requiring minor changes to existing instruments. The regulatory process should consider the following factors:

Step 1 – gathering sources of reliable data and collective experience that could be used in the assessment of the compelling need for IMO to address an issue in its regulatory framework, including such aspects as availability, consistency and accessibility of data; and consideration on how other industries address these issues,

216 In particular, the measurement of changes in hull and propeller performance, which are important for determining vessel efficiency and consequences for emissions, resulting to date in ISO 15016:2015: *Ships and Marine Technology – Guidelines for the assessment of speed and power performance*, usually applied during sea trials. *Ibid.*

217 For example, the ISO 14000 series aims to provide clarity and consistency for quantifying, monitoring, reporting, validating or verifying GHG emissions. *Ibid.*

218 *Guidelines on the Organization and Method of Work of the Maritime Safety Committee and the Marine Environment Committee and Their Subsidiary Bodies*, IMO Doc MSC-MEPC.1/Circ.4/Rev.4 (10 June 2015).

219 *Principles to Be Considered in the Review of Existing Requirements and the Development of New Requirements*, Submitted by Jamaica, Liberia, the Marshall Islands, Panama, the United Kingdom, BIMCO, IACS, ICS, INTERCARGO and INTERTANKO, IMO Doc C/ES.28/9/1 (20 October 2015) [IMO Doc C/ES.28/9/1]; *Further Discussion of the Principles and the Development of a Framework*, Submitted by Greece, Sweden, the United Kingdom, BIMCO, IACS, INTERCARGO and INTERTANKO, IMO Doc C 117/14 (4 November 2016).

capture data and apply risk-based methods in developing regulations;

Step 2 – considering whether IMO action is necessary now, in particular when issues are uncertain and the impact of a new regulation is difficult to estimate or when it is known that other measures to address the issue have already been agreed or recently implemented in the industry that address the issue (for example, answering the question whether action by IMO is really needed and identifying the scale of the problem that the new regulation should solve);

Step 3 – using cost-effectiveness and impact analyses to estimate short-term and long-term benefits due to the implementation of the new regulation (for example, in terms of enhancement of safety of life at sea, or protection of the marine environment) and associated costs (including potential negative consequential impacts in other areas, difficulty in practical application, legislative and administrative burdens);

Step 4 – assessing the availability of suitable technologies to be installed on new and/or existing ships and estimating a realistic time frame for their implementation to assess whether a system or a technology will be available to meet the objectives of a new regulation, and available from a commercially competitive market;

Step 5 – evaluating the transparency and robustness of approval procedures for possible new equipment to ensure compliance with both regulatory and operational requirements;

Step 6 – considering the impact on manufacturers to produce and deliver the required systems (for example, whether suitable facilities are available to install

these technologies and a realistic time frame for their implementation, to reach the required production volumes) with possible contributions of individual manufacturers and/or manufacturer associations;

Step 7 – assessing the availability of clear and unambiguous criteria for surveying, inspecting and testing new technologies on board. The situation should be avoided when properly used and maintained type approved systems, in accordance with requirement of the new provisions, are found non-compliant when examined against the criteria of other regulatory bodies or authorities, including port state control;

Step 8 – considering an achievable time frame to test and consolidate a technology before deciding on the implementation dates; and

Step 9 – evaluating potential conflicts of benefits and detriments between environmental, economic and social issues, assuming safety and security as paramount, by applying risk-based approaches (for example, Formal Safety Assessment, Safety Level Approach), where needed, performance-based methods and/or other qualitative or quantitative considerations.²²⁰

The proposals suggest that the assessment process would be undertaken at three stages, namely, when first submitted, at an intermediate stage (when deliberations extend beyond a biennium), and at final assessment of the proposed regulatory package “to assist the committee in making a final decision as to whether or not the regulatory package is ‘fit for purpose’, proportionate and without excessive burden on industry.”²²¹ In the final assessment, the criteria applied include what ships will be subject to the requirement, proposed date of application, whether there are suitable technologies, and determining

²²⁰ IMO Doc C/ES.28/9/1, *supra* note 219, annex.

²²¹ *Ibid.*

that approval processes and implementation guidelines are in place, that impacts on manufacturers and operators are ascertained, and that capacity-building needs are identified.

IMO Efforts in Developing the Industry's Contribution to Mitigation

The issue of air pollution from ships was first considered in the IMO in the 1980s, in connection with the review of the quality of fuel oils, but it was not until 1988 that air pollution was added as an MEPC agenda item. Subsequent committee discussions on fuel quality led, in 1990, to inclusion of the issue in the long-term work plan, followed in 1991 by a milestone assembly resolution on prevention of air pollution and pollution from garbage from ships,²²² which paved the way for the future adoption of Annex VI.²²³ The first regulations appeared with MARPOL Annex VI, through the Protocol of 1997 adopted at a diplomatic conference on air pollution that year.²²⁴ By then, a number of initiatives in other fora had already addressed various forms of atmospheric emissions.²²⁵

The Kyoto Protocol requires Annex I state parties to the UNFCCC to pursue, through the IMO, the reduction of GHG emissions from marine bunker fuels not addressed by the Montreal Protocol.²²⁶ In 1997, an IMO air pollution conference invited the MEPC to consider what CO₂ strategies might be feasible in light of the relationship of that gas with other atmospheric pollutants, citing the IMO's

task under the Kyoto Protocol.²²⁷ Since MEPC 42, there has been ongoing cooperation between the Secretariats of the IMO and the UNFCCC, including SBSTA,²²⁸ for example, through the provision of information to the various sessions of the latter.²²⁹

In 2000, MEPC 45 agreed to discuss GHG emissions after considering a study commissioned by MEPC 42²³⁰ and prepared by the IMO Secretariat (the first GHG study),²³¹ following further submissions by Japan and the United Kingdom.²³² MEPC 46 considered this issue and, following submissions by Norway and the United Kingdom on the need to develop an IMO GHG strategy, which received broad support, it was agreed that a working group would be established at MEPC 47.²³³ The working group was to evaluate emissions reduction proposals, receive proposals from member states, identify appropriate IMO sub-committees for the issue and prepare materials for a future strategy.²³⁴ The focus was on CO₂,²³⁵ although an intersessional correspondence group felt such an approach should be for the short term and without limiting the future general strategy.²³⁶ To facilitate discussion of the proposed assembly resolution, the correspondence group considered a base document exploring possible elements of a future IMO strategy for GHGs.²³⁷ It proposed a resolution on IMO Policies and Practices related to the Reduction of Greenhouse Gas Emissions from Ships,²³⁸ which was subsequently adopted

222 Resolution A.719(17), *supra* note 199.

223 The initial Annex VI set a general cap of 4.5 percent m/m on the sulphur content of fuel (compared to 0.5 percent at this time), controls of nitrogen oxides, prohibition of deliberate emission of ozone-depleting substances (halons and chlorofluorocarbons [CFCs]) and prohibition of onboard incineration of products containing contaminated packaging materials and polychlorinated biphenyls. Annex VI also designated the Baltic Sea as the first ECA with a higher standard for SO_x (1.5 percent m/m, compared to 4.5 percent).

224 Protocol of 1997, *supra* note 104.

225 See e.g. *Convention on Long-range Transboundary Air Pollution*, 13 November 1979, 1302 UNTS 217, 18 ILM 1442 (entered into force 16 March 1983), amended by protocols to address emissions of sulphur (1985), nitrogen oxides (1988), volatile organic compounds (1991) and further reducing sulphur emissions (1994); *Montreal Protocol on Substances that Deplete the Ozone Layer*, 16 September 1987, 1522 UNTS 3, 26 ILM 1550 (entered into force 1 January 1989), amended by the protocol of 1990 phasing out halons and ozone-depleting CFCs by 2000, and by the protocol of 1992 accelerating phase-outs and adding phase-out dates for hydrochlorofluorocarbons and methyl bromide.

226 Kyoto Protocol, *supra* note 25, art 2(2).

227 Resolution 8 of the 1997 Air Pollution Conference, referred to in *Report of the MEPC on its 45th Session*, IMO Doc MEPC 45/20 (16 October 2000) at 55.

228 Following an initial request by MEPC 41. *Report of the MEPC on its 42nd Session*, IMO Doc MEPC 42/22 (16 November 1998) at 32–33 [MEPC 42 Report].

229 See e.g. *Report of the MEPC on its 44th Session*, IMO Doc MEPC 44/20 (12 April 2000) at 39–40 [MEPC 44 Report].

230 MEPC 42 Report, *supra* note 228 at 35.

231 *Report on the Outcome of the IMO Study on Greenhouse Gas Emissions from Ships*, Submitted by the Secretariat, IMO Doc MEPC 45/8 (29 June 2000).

232 MEPC 44 Report, *supra* note 229 at 56.

233 *Report of the MEPC on its 46th Session*, IMO Doc MEPC 46/23 (16 May 2001) at 52–53.

234 *Ibid* at 53.

235 *Report of the MEPC on its 47th Session*, IMO Doc MEPC 47/20 (18 March 2002) at 24.

236 *Report of the Correspondence Group on Greenhouse Gas Emissions from Ships*, Submitted by Norway, IMO Doc MEPC 48/4/1 (4 July 2002) at 2.

237 *Ibid*, annex 2.

238 *Ibid*, annex 1.

by the assembly in 2003.²³⁹ The resolution urged the MEPC to identify and develop the mechanisms needed to enable limitation or reduction of GHG emissions from international shipping and to prioritize establishment of a GHG emissions baseline, development of a methodology to describe the GHG efficiency through an emissions index, development of guidelines for application and verification of a GHG emissions indexing scheme, and evaluation of technical, operational and market-based solutions. The MEPC was also requested to consider methodological aspects of GHG emissions reporting, develop a work plan with a timetable and maintain the item under review. It is important to note that the assembly resolution proposed to address all ships, rather than simply the states listed in Annex I of the Kyoto Protocol, although this would become a divisive matter.²⁴⁰

Chaired by Norway, the correspondence group's work, while important in advancing IMO efforts on GHG, was characterized by increasingly diverse views on what a future strategy should accomplish. By MEPC 51, a growing minority of developing countries vocalized their concern that the organization's GHG work should be guided by UNFCCC principles and that Kyoto Annex I countries should be taking the lead in reducing emissions.²⁴¹ These concerns required additional work in the correspondence group. At MEPC 52, the committee divided consideration of the issue into two steps: the first to focus on technical matters and the second to address "political issues," including NMFT and CBRD.²⁴² With respect to the former, the committee instructed the correspondence group to continue technical work on guidelines for a CO₂ indexing scheme as a voluntary mechanism on the basis of interim guidelines.²⁴³ In-depth work on CO₂ indexing proceeded at the Technical Workshop on GHG Indexing Scheme held at the IMO in 2005 on the basis of sea trials and studies by a few volunteering flag states, industry actors and

the European Union.²⁴⁴ The conclusion was that technical guidelines worked, but that a number of issues needed to be addressed, including the formula for calculation of indexing (specific to fuels with different conversion factors), data standardization and development of a method for the index for new builds.²⁴⁵ As to the "political issues," the sharp division of views represented, on the one hand, by Norway²⁴⁶ for NMFT and, on the other, by China²⁴⁷ for CBRD led the chair to conclude that "it would be advisable to continue the common ground found on technical matters and defer the application issue to a later stage when an agreement had been reached elsewhere."²⁴⁸

The Working Group on Air Pollution was reconstituted at MEPC 54²⁴⁹ and its work led to MEPC 55 deciding on an updated plan of work, based on three main lines of action.²⁵⁰ First, with

239 Adopted first at MEPC 49: *Report of the MEPC on its 49th Session*, IMO Doc MEPC 49/22/Add.1 (13 August 2003), annex 7. It was subsequently adopted by Resolution A.963(23), 5 December 2003 (Agenda item 19), IMO Doc A 23/Res.963 (4 March 2004) [Resolution A.963(23)].

240 This point was raised in the *Report of the MEPC on its 49th Session*, IMO Doc MEPC 49/22 (8 August 2003) at 33–34.

241 Brazil, China, India, Indonesia, Pakistan, Singapore and Saudi Arabia. *Report of the IMO on its 51st Session*, IMO Doc MEPC 51/22 (22 April 2004) at 20.

242 *Report of the MEPC on its 52nd Session*, IMO Doc MEPC 52/24 (18 October 2004) at 26 [MEPC 52 Report].

243 MEPC Circular on the *Interim Guidelines for Voluntary Ship CO₂ Emission Indexing for Use in Trials*, IMO Doc MEPC/Circ.471 (29 July 2005).

244 *Report of the One-day Technical Workshop on GHG Indexing Scheme held at IMO Headquarters on Friday, 15 July 2005*, IMO Doc MEPC 53/WP.3 (15 July 2005).

245 *Ibid.* at 8.

246 Norway's position was summarized as "the tradition of IMO was to develop mechanisms, either voluntary or mandatory, which apply equally to each Member State. The IMO Convention article 1(b) on the purpose of the Organization, the removal of discriminatory action was addressed, and as such, the inclusion of the differentiated approach in any IMO GHG mechanism to be developed would be in conflict with the purpose of the Organization. Further, Norway referred to the well-established principle of 'no more favourable treatment' in IMO instruments. In conclusion, Norway highlighted that the principle of equal application to IMO Member States should also apply to the IMO work on GHG emissions from international shipping." *MEPC 52 Report*, *supra* note 242 at 27.

247 China's position was summarized as "IMO was asked to deal with limitation and reduction of greenhouse gas emissions by the Kyoto Protocol, which only obliges Annex I countries of UNFCCC to do so. IMO Assembly resolution A.963(23) clearly acknowledged the relevant provisions of the Kyoto Protocol. During the deliberation on the matter, the recommendation of the MEPC that 'the Assembly resolution on IMO Policies and Practices related to reduction of greenhouse gas emissions from ships should be based on a common policy applicable to all ships, rather than based on the provisions of the Kyoto Protocol which stated that the reduction of greenhouse gas emissions is under the responsibility of the Annex I countries of the Protocol' was rejected by the IMO Assembly. It proves that the above assertion was wrong. If the limitation or reduction of greenhouse gas emissions is equally applied to both developed and developing countries, the developing countries will be discriminated for the following reasons: first, 79% of greenhouse gases were emitted by the developed countries; second, the Kyoto Protocol only obliges Annex I countries to pursue reduction of greenhouse gas emissions through IMO; and thirdly, the developing countries are technologically lagging behind. China also pointed out that the reason why IMO did not apply the 'common but differentiated responsibility' principle when dealing with matters concerning the Montreal Protocol and the Basel Convention is that these documents did not provide that the developed countries should pursue limitation or reduction of related materials through IMO. In conclusion, China stressed that the 'common but differentiated responsibility' principle should be observed by IMO when addressing greenhouse gas emissions from ships." *Ibid.*

248 *Ibid.*

249 To consider, among other things, the development of a draft framework and work plan with timetable, including options for technical, operational and/or market-based mechanisms. *Report of the MEPC on its 54th Session*, IMO Doc MEPC 54/21 (27 March 2006) at 25–26.

250 *Report of the MEPC on its 55th Session*, IMO Doc MEPC 55/23 (16 October 2006) at 31–32, annex 9.

respect to the CO₂ Emission Indexing Scheme, member states and industry were urged to continue to carry out trials with a view to improving the indexing method in the interim guidelines. Second, work on the CO₂ emission efficiency baseline and methodology would continue, with a view to drafting a proposal. Third, technical, operational and market measures would be considered. However, by MEPC 56, there was growing concern in the IMO at the protracted negotiations without tangible outcomes, and the concern that lack of progress might encourage unilateral national or regional initiatives.²⁵¹ The need for a new GHG study was agreed as an action item.²⁵² At this session, Norway fielded a proposal that potentially simplified the development of an IMO strategy by proposing a CO₂ toll that would apply to all international shipping, not dependent on a baseline, and that would lead to the establishment of an international fund.²⁵³ This was the first proposal for an MBM and, in essence, consisted of a uniform carbon tax. Views both for and against the proposal were expressed, but the committee agreed the working group should consider all options for technical, operational and market measures that may be submitted.²⁵⁴

Several member states submitted technical, operational and MBM ideas to a correspondence group, which were reported to MEPC 57.²⁵⁵ The correspondence group undertook an in-depth and systematic discussion of proposed measures and their suitability for the short or long term, including pros and cons. The group identified policy issues, including the NMFT and CBRD duet, the possibility that regional or national approaches might arise if a global approach was not feasible, and whether shipping could be considered under the CDM of the Kyoto Protocol.²⁵⁶ A collective submission by delegations and industry organizations with consultative status proposed that any future regulations should be based on fundamental principles that would inform the future IMO framework

for GHG regulation.²⁵⁷ This was embraced by MEPC 57, concluding that the framework:

- a. must be effective in contributing to the reduction of total global greenhouse gas emissions;
- b. binding and equally applicable to all flag States in order to avoid evasion;
- c. cost-effective;
- d. able to limit, or at least, effectively minimize competitive distortion;
- e. based on sustainable environmental development without penalizing global trade and growth;
- f. based on a goal-based approach and not prescribe specific methods;
- g. supportive of promoting and facilitating technical innovation and R&D in the entire shipping sector;
- h. accommodating to leading technologies in the field of energy efficiency; and
- i. practical, transparent, fraud free and easy to administer.²⁵⁸

The principles were adopted by a majority vote called by the chair after a difficult debate. The vote raised a fundamental question as to whether the IMO will be able to adopt new rules and standards for GHG regulation based on the usual practice of consensus. Some member states continued to be of the view that developed states had a special responsibility under the Kyoto Protocol, while the majority placed faith in the culture of IMO regulation as it applies to all ships. The vote reflected a deep rift between developed and some developing countries. China and Brazil reserved their position on the principles, with Barbados, South Africa and Venezuela sharing their concerns.²⁵⁹ India wanted to amend the first principle while

²⁵¹ Report of the MEPC on its 56th Session, IMO Doc MEPC 56/23 (30 July 2007) at 34–35 [MEPC 56 Report].

²⁵² *Ibid* at 33–34, annex 9.

²⁵³ Elements of a Possible Market-based CO₂ Emission Reduction Scheme, Submitted by Norway, IMO Doc MEPC 56/4/9 (4 May 2007).

²⁵⁴ MEPC 56 Report, *supra* note 251 at 36.

²⁵⁵ Report of the Intersessional Correspondence Group on Greenhouse Gas Related Issues, Submitted by Australia and the Netherlands, IMO Doc MEPC 57/4/5 (21 December 2007).

²⁵⁶ Report of the MEPC on its 57th Session, IMO Doc MEPC 57/21 (7 April 2008) at 46 [MEPC 57 Report].

²⁵⁷ Future IMO Regulation Regarding Greenhouse Gas Emissions from International Shipping, Submitted by Denmark, Marshall Islands, BIMCO, ICS, INTERCARGO, INTERTANKO and OCIMF, IMO Doc MEPC 57/4/2 (21 December 2008).

²⁵⁸ MEPC 57 Report, *supra* note 256 at 47.

²⁵⁹ *Ibid* at 48.

rejecting the second and was supported by Barbados, Brazil, South Africa and Venezuela.²⁶⁰

There was more unity in the various industry sectors. Discussions in the Tripartite Working Group, consisting of representatives of shipyards, ship owners and classification societies, supported a cross-industry-based goal.²⁶¹ This, as well as other proposals, including technical submissions and a Danish proposal for a global levy on bunker fuel as a short-term measure,²⁶² were referred to the working group. There was growing support for a mandatory CO₂ design index for new ships, which was referred to the working group.²⁶³ In turn, during MEPC 57, the Working Group on GHG Emissions from Ships discussed the various submissions, guided by the nine principles, although some participating states reiterated their reservations on the application of the second principle.²⁶⁴ Drawing on its previous work, the working group focused on a set of short-term and long-term measures, with the former constituting the basis for new energy efficiency regulations.²⁶⁵ It proceeded to plan its prospective intersessional work for CO₂ design and operational indices and MBMs.²⁶⁶

The timing of MEPC 57 signified a sense of urgency to progress on the GHG issue because of the need to coordinate inputs concerning GHG emissions reduction efforts in the maritime sector into the UNFCCC process and the 2009 UN Climate Change Conference in Copenhagen. In essence, the MEPC was tasked with developing the international shipping industry's commitment. The IMO secretary-general proposed acceleration of work, namely completing work on the CO₂ Emission Indexing Scheme and the CO₂ emission baseline(s) by MEPC 58.²⁶⁷ As for deliberations on the technical and operational measures and MBMs, the secretary-

general proposed completion of that task by MEPC 59 in 2009. Both suggestions were adopted.²⁶⁸

In June 2008, Norway hosted a major intersessional working group that significantly advanced the IMO's work on GHG emissions and enabled MEPC 58 to make progress.²⁶⁹ The MEPC formed a working group to try to finalize work on the CO₂ emissions design and operational indices (now renamed as EEDI and Energy Efficiency Operational Indicator [EEOI], respectively, on the basis of a proposal by Brazil) and considered proposals for the Ship Efficiency Management Plan.²⁷⁰ This time, the working group was tasked with a GHG-specific mandate, rather than to consider all air pollution issues within the MEPC's purview. A draft interim EEDI for new ships was produced for trial purposes, but more work on the operational index and management plan was needed. A key issue was what form new mandatory measures should take, i.e., whether they should be developed as amendments to MARPOL Annex VI, a new Annex VII, or even a new stand-alone instrument, but this was not resolved.²⁷¹

The MEPC 58 deliberations on MBMs constituted the first in-depth substantive discussion on such measures. As such, the discussion was less fruitful than on technical measures, in part because of their controversy, and because not all submissions were considered due to time constraints. Even so, a range of ideas were acknowledged as interesting and worth further study. Although some were argued as reasonably straightforward to introduce, there was considerable uncertainty as to how they would work, and that consequently member states needed more information.²⁷² Fundamental differences on principles remained, most especially whether new emissions requirements should bind UNFCCC and Kyoto Protocol Annex I states, a view now shared by a growing number of developing countries, or whether all states should be making them applicable to all ships.²⁷³ The reality is that international shipping emissions cannot easily be attributed to any particular territory and if ships

²⁶⁰ *Ibid.*

²⁶¹ A Cross-industry Goal-based Approach to Reduction of GHG Emissions from New Ships, Submitted by the ICS, BIMCO, CESA, IACS, INTERCARGO, INTERTANKO and OCIMF, IMO Doc MEPC 57/4/8 (23 January 2008).

²⁶² MEPC 57 Report, *supra* note 256 at 50–51.

²⁶³ *Ibid.* at 50.

²⁶⁴ Namely Brazil, China, India, Saudi Arabia, South Africa and Venezuela. Report of the Working Group on GHG Emissions from Ships, IMO Doc MEPC 57/WP.8 (3 April 2008).

²⁶⁵ *Ibid.*, annex 1.

²⁶⁶ *Ibid.* at 4–5, annex 3.

²⁶⁷ Possible Expediting of IMO's Work on Reduction of GHG Emissions from Ships, Note by the Secretary-General, IMO Doc MEPC 57/4/7 (21 January 2008).

²⁶⁸ MEPC 57 Report, *supra* note 256 at 51–52.

²⁶⁹ Report of the Outcome of the First Intersessional Meeting of the Working Group on Greenhouse Gas Emissions from Ships, Note by the Secretariat, IMO Doc MEPC 58/4 (4 July 2008).

²⁷⁰ Report of the MEPC on its 58th Session, IMO Doc MEPC 58/23 (16 October 2008) at 36–37.

²⁷¹ *Ibid.* at 33–34.

²⁷² *Ibid.* at 37–39.

²⁷³ *Ibid.*, annex 9.

registered under the flags of developing states were to be excluded or given preference, the whole purpose of reducing emissions from international shipping would be undermined. At MEPC 58, there was a growing understanding that there could be other ways to address CBDR, for example, through technology transfer and funds generated from a prospective MBM. However, the uncertainty around MBMs did not generate confidence that the special needs of developing countries would be addressed in a satisfactory manner. At this point, debate on the question of who should bear the bulk of responsibility for GHG emissions reductions from international shipping highlighted a profound North-South divide. Moreover, there were other divisions. For example, Greece, a major ship-owning state, opposed MBMs until their added value to the efficiency of shipping could be demonstrated, and reiterated some views expressed at the intersessional meeting hosted by Norway that the Danish proposal for a fuel levy was essentially a tax that would impede international trade.²⁷⁴

On the eve of UNFCCC COP 15 in December 2009 and the inception of its fifty-ninth session in July, the MEPC had not yet met the secretary-general's expedited agenda. COP 15 was expected to adopt a new post-2012 agreement to combat climate change. The IMO had already submitted ideas for international shipping to the Ad Hoc Working Group on Long-term Cooperative Action under the Convention.²⁷⁵ The IMO was under pressure to demonstrate commitment to the international community, at least with respect to its work on energy efficiency. There remained fundamental differences on principles and concern over insufficient information to deliberate on some issues. Environmental NGOs added pressure by indicating their readiness to call upon other fora, such as the UNFCCC or the European Union, to take timely and appropriate actions if MEPC 59 did not produce agreement.²⁷⁶ Even so, MEPC 59 made progress. The committee instructed the working group to finalize work on the EEDI and the EEOI.²⁷⁷

274 *Ibid*, annex 10.

275 *United Nations Framework Convention on Climate Change (UNFCCC), Shipping-relevant Ideas and Proposals to the UNFCCC Process in 2008*, Note by the Secretariat, IMO Doc MEPC 59/INF.29 (22 May 2009).

276 *IMO Must Act Decisively to Reduce GHG Emissions from Shipping if it is to Retain its Competence in Technical and Political Matters related to Shipping and GHGs*, Submitted by Friends of the Earth International, Greenpeace International and World Wild Fund for Nature, IMO Doc MEPC 59/4/47 (22 May 2009) at 5.

277 *Report of the MEPC on its 59th Session*, IMO Doc MEPC 59/24 (27 July 2009) at 42–44 [MEPC 59 Report].

Work on the SEMP as a fuel efficiency management tool would continue in view of finalization and a guidance document on best practices for fuel-efficient operations was finalized.²⁷⁸

MEPC 59 resumed discussion of MBMs and new proposals were submitted in addition to Denmark's earlier submission. These included an emission trading scheme (cap and trade) applicable to all ships proposed by France, Germany and Norway,²⁷⁹ and a leveraged incentive scheme proposed by Japan.²⁸⁰ Although not advancing an MBM, the United States proposed mandatory efficiency standards for new and existing ships using the EEDI that could accompany an MBM.²⁸¹ These and other proposals are further discussed later in this report. Potential emissions reduction scenarios from MBMs were considered, but there was no agreement on whether targets should also be set.²⁸² It was noted that the discussion was still conceptual at this stage and would need to be continued through future sessions.²⁸³ Earlier concerns regarding their uncertain impact, especially on developing countries, were reiterated.²⁸⁴ A majority of delegations agreed to continue consideration of MBMs.²⁸⁵

The second IMO GHG Study, commissioned at MEPC 56, was completed.²⁸⁶ Among others, it concluded that shipping emitted 3.3 percent of global CO₂ emissions in 2007, and international shipping approximately 2.7 percent, mostly through exhausts, with CO₂ being the most significant contributor. By 2050, and in a business-as-usual scenario, ship emissions could grow by 150 percent to 250 percent, commensurate with growth in world trade. If technical and operational

278 *Ibid* at 43.

279 *Positive Aspects of a Global Emission Trading Scheme for International Shipping*, Submitted by France, Germany and Norway, IMO Doc MEPC 59/4/25 (8 May 2009); *Cornerstones for an Outline of a Convention of a Global Emission Trading Scheme for International Shipping*, Submitted by France, Germany and Norway, IMO Doc MEPC 59/4/26 (8 May 2009).

280 *Consideration of a Market-based Mechanism to Improve the Energy Efficiency of Ships Based on the International GHG Fund*, Submitted by Japan, IMO Doc MEPC 59/4/34 (8 May 2009).

281 *Comments on MEPC 59/4/2 and MEPC 59/4/4 and an Additional Approach to Addressing Maritime GHG Emissions*, Submitted by the United States, IMO Doc MEPC 59/4/48 (22 May 2009).

282 MEPC 59 Report, *supra* note 277 at 47.

283 *Ibid* at 48.

284 *Ibid* at 48–50.

285 *Ibid* at 50.

286 *Second IMO GHG Study 2009: Update of the 2000 IMO GHG Study – Status Report from the Steering Committee*, Note by the Secretariat, IMO Doc MEPC 59/4/4 (8 April 2009) [Second GHG Study].

measures to enhance efficiency (for example, EEDI), which were deemed cost-efficient, were to be used, emissions could be reduced by 25 percent to 75 percent below these projections. The report further “found that market-based measures were cost-effective policy instruments with a high environmental effectiveness.”²⁸⁷ Moreover, MBMs “captured the largest amount of emissions under the scope, allowed both technical and operational measures in the shipping sector to be used, and could offset emissions in other sectors.”²⁸⁸ The environmental benefit of EEDI was limited because it only applied to new ships and incentivized design improvements without including operations. In a business-as-usual scenario for the industry and an emissions scenario where global temperatures stabilize at 2°C above pre-industrial levels by 2100, ship emissions were estimated to constitute 12 percent to 18 percent of the global total CO₂ emissions in 2050.

The 2009 Copenhagen conference failed to produce the expected climate treaty, but this did not eliminate pressure on the IMO. The Copenhagen Accord did not expressly mention bunker fuels, however, the reference to the need to reduce global emissions to maintain global temperature to below 2°C from pre-industrial levels nevertheless raised the question, “What would be a fair contribution for the international shipping sector to achieving this long term goal?”²⁸⁹ MEPC 60 resumed this task and had before it more than 100 documents to consider. A significant breakthrough was a proposal by Japan, Norway and the United States to establish the EEDI for new ships and the SEEMP for all ships in operation as a new mandatory part in MARPOL Annex VI.²⁹⁰ MARPOL was already addressing ozone-depleting substances, some of which contributed to climate change, and had a well-established survey and certification system. The convention’s tacit acceptance process for amendments provided a fast route to implementation if Annex VI was used as the

vehicle.²⁹¹ Not all delegations supported the Annex VI route, as it was questioned whether CO₂ was in fact a pollutant within the meaning and intent of the convention. Some preferred a stand-alone instrument, similar to the International Convention for the Control and Management of Ships’ Ballast Water and Sediments (BWM Convention) and Hong Kong Ship Recycling Convention. The organization’s legal division advised that there were no legal obstacles to using Annex VI for GHG regulation and, on the contrary, this regulatory route was consistent with the annex’s purposes.²⁹² Others, mostly developing countries, did not support mandatory regulations, preferring to see further development and trials first.²⁹³ The issue was put to a vote and the majority supported using Annex VI as the regulatory vehicle. The Working Group on Energy Efficiency Measures for Ships, tasked with the development of mandatory legal text and consideration of related guidelines, likewise did not find consensus,²⁹⁴ prompting an intervention by the secretary-general.²⁹⁵ The impasse was not only with respect to developing-country concerns over mandatory measures, but also with regard to convening a further intersessional meeting of the working group to complete its tasks. This decision was put to the vote and the majority gave the working group the green light to address outstanding tasks.

Consideration of how to move forward the discussion on MBMs led MEPC 60 to establish an expert group to undertake a feasibility study

²⁸⁷ MEPC 59 Report, *supra* note 277 at 38.

²⁸⁸ *Ibid.*

²⁸⁹ Report of the MEPC on its 60th Session, IMO Doc MEPC 60/22 (12 April 2010) at 22 [MEPC 60 Report].

²⁹⁰ Mandatory EEDI Requirements – Draft Text for Adding a New Part to MARPOL Annex VI for Regulation of the Energy Efficiency of Ships, Submitted by Japan, Norway and the United States, IMO Doc MEPC 60/4/35 (15 January 2010).

²⁹¹ MEPC 60 Report, *supra* note 289 at 25–29. The tacit acceptance procedure is a technique for the adoption of amendments to the international maritime conventions introduced to replace the need for a formal diplomatic conference. The procedure is especially useful for technical rules, such as those in annexes, that require frequent amendment. Amendments are adopted by a resolution of a committee responsible for the convention (such as the MSC for SOLAS and MEPC for MARPOL) by a specified majority of voting state parties to the amended instrument, although in practice most amendments are adopted by consensus. The amendments enter into force following the expiry of a designated period for the registration of objections. Unless there is objection to amendments by a specified minority of state parties, the amendments enter into force without further procedure. See MARPOL, *supra* note 10, art 16.

²⁹² MEPC 60 Report, *supra* note 289 at 28–39.

²⁹³ Brazil, China, Cuba, India, Peru, Saudi Arabia and Venezuela. *Ibid* at 30, 33.

²⁹⁴ *Ibid* at 30–31 for terms of reference and 31–32 for the working group’s report.

²⁹⁵ “In this Organization, we dislike taking a vote. Voting is divisive and one would ask what chances of implementation have the technical standards adopted in this Organization if the decision to introduce that standard has been made on a 51 to 49 percent basis. Sometimes, the decision, if consensus cannot be achieved, will have to be made in accordance with the Organization’s well established and well-functioning Rules of Procedure, meaning that decisions are made on a majority basis, which leads to the conclusion that whatever people may think, this is a democratically based Organization.” *Ibid* at 32.

and impact assessment of MBMs and report to the committee,²⁹⁶ while focusing on 10 specific proposals and other submissions.²⁹⁷ The relevance and application of the CBDR principle was underscored, but, even so, several major developing countries reserved their positions on the terms of reference and the Expert Group on Feasibility Study and Impact Assessment of possible Market-based Measures was established by majority vote.²⁹⁸ Another subject of disagreement was whether the international maritime sector should be subject to an express emission cap or reduction target for the world fleet. Norway submitted scenarios for caps for 2020 and 2030.²⁹⁹ The industry response preferred an approach that was consistent across the entire global transportation sector and aimed at improving efficiency of the global fleet rather than imposing a cap.³⁰⁰ The International Union for Conservation of Nature (IUCN) argued for an approach that integrates a proposed rebate mechanism in the design of an MBM and that this would help reconcile the principles undergirding the IMO and UNFCCC regimes.³⁰¹

Intersessional work on the details of the regulatory text of the EEDI and SEEMP continued, identifying several issues and possible approaches proposed to MEPC 61. MEPC 61 was further informed by important scientific documents that explored scenarios of likely reductions in emissions by

employing technical and operational measures,³⁰² using excess capacity in the shipping industry as an opportunity to employ slow-speed regimes,³⁰³ and combining energy efficiency and a proposed carbon credit trading scheme.³⁰⁴ Speed controls could potentially generate substantial savings, depending on the type of ship or voyage segment. It was felt that no such new dedicated operational rule was needed, as this measure would be captured by the EEDI and SEEMP.³⁰⁵ However, at a minimum, it was important to ensure that sufficient reserve power was maintained to retain full vessel manoeuvrability.³⁰⁶ Proposals for introducing correction factors to the EEDI were treated with caution, as it was important not to create exceptions, other than for weather and polar class.³⁰⁷ A proposal for relaxing standards for remotely located states and SIDS was rejected for several reasons, including that substandard ships would be pushed into the trades of those states.³⁰⁸ Similarly, differentiating between ship construction in developed and developing states was rejected.³⁰⁹ If EEDI and SEEMP were to be made mandatory, regional and national capacity building would be needed for implementation and enforcement.³¹⁰ MEPC 61 also considered the report of the Expert Group on Feasibility Study and Impact Assessment of Possible Market-based Measures. The report presented an analysis of the 10 proposals submitted by member states aimed at targeting GHG reductions through in-sector emissions reductions or out-of-sector emissions reductions.³¹¹ The committee could not reach consensus on the MBM to pursue and left further deliberation of

296 *Ibid* at 37.

297 Specifically, on: An International Fund for Greenhouse Gas Emissions from Ships (Cyprus, Denmark, the Marshall Islands, Nigeria and the IPTA); Market-based Instruments: A Penalty on Trade and Development (Bahamas); Further details on the United States Proposal to Reduce Greenhouse Gas Emissions from International Shipping (United States); A Further Outline of a Global Emission Trading System (ETS) for International Shipping (Norway); A Global Emissions Trading System for Greenhouse Gas Emissions from International Shipping (United Kingdom); Consideration of a Market-based Mechanism: Leveraged Incentive Scheme to Improve the Energy Efficiency for Ships Based on the International GHG Fund (Japan); Proposal to Establish a Vessel Efficiency System (VES) (World Shipping Council); Achieving Reduction in Greenhouse Gas Emissions from Ships through Port State Arrangements Utilizing the Ship Traffic, Energy and Environment Model, STEEM (Jamaica); Further Elements for the Development of an Emissions Trading System for International Shipping (France); Impact Assessment of an Emissions Trading Scheme with a Particular View on Developing Countries (Germany); and A Rebate Mechanism for a Market-based Instrument for International Shipping (International Union for Conservation of Nature). *Ibid* at 37–38.

298 *Ibid* at 40, annex 8. See annex 9 for statements by delegations.

299 *Alternative Emission Caps for Shipping in 2020 and 2030*, Submitted by Norway, IMO Doc MEPC 60/4/23 (15 January 2010).

300 *Emission “Caps” and Reduction Targets*, Submitted by the World Shipping Council (WSC), IMO Doc MEPC 60/4/28 (15 January 2010).

301 *A Rebate Mechanism for a Market-based Instrument for International Shipping*, Submitted by IUCN, IMO Doc MEPC 60/4/55 (29 January 2010) [MEPC 60/4/55]. The WWF has subsequently submitted follow-up proposals that build on this approach. See e.g. *Draft Legal Text on Uses of Financing Generated from a Maritime MBM*, Submitted by the World Wide Fund for Nature (WWF), IMO Doc MEPC 64/5/10 (27 July 2012).

302 *Marginal Abatement Costs and Cost-effectiveness of Energy-efficiency Measures*, Submitted by the Institute of Marine Engineering, Science and Technology (IMarEST), IMO Doc MEPC 61/INF.18 (23 July 2010).

303 *Going Slow to Reduce Emissions – Can the Current Surplus of Maritime Transport Capacity be Turned into an Opportunity to Reduce GHG Emissions?*, Submitted by the Clean Shipping Coalition (CSC), IMO Doc MEPC 61/INF.22 (23 July 2010).

304 *Further Details on the US Proposal to Reduce Greenhouse Gas Emissions from International Shipping*, Submitted by the United States, IMO Doc MEPC 61/INF.24 (23 July 2010) [MEPC 61/INF.24].

305 *Ibid* at 29–30.

306 *Report of the MEPC on its 61st Session*, IMO Doc MEPC 61/24 (6 October 2010) [MEPC 61 Report]. Proposal by IACS at 34–35.

307 *Ibid* at 34.

308 Proposed by Vanuatu. *Ibid* at 35–36.

309 Proposed by China. *Ibid* at 38.

310 *Ibid* at 28–29.

311 *Full Report of the Work Undertaken by the Expert Group on Feasibility Study and Impact Assessment of Possible Market-based Measures*, Note by the Secretariat, IMO Doc MEPC 61/INF.2 (13 August 2010).

this issue to intersessional work,³¹² with some delegations expressing strong reservations.³¹³

At MEPC 62 in 2011, the Drafting Group on Amendments to Mandatory Instruments (Part II) completed final revisions for the proposed amendments to MARPOL Annex VI.³¹⁴ A new Chapter 4 made the EEDI mandatory for new ships and the SEEMP for all new and existing ships, with entry into force on January 1, 2013. Breaking with the culture of consensus on the adoption of new rules and standards, the amending resolution was forced to a vote and 49 out of the 59 (at the time) MARPOL Annex VI state parties voted in favour, with Brazil, Chile, China, Kuwait and Saudi Arabia voting against. The remaining five states abstained or did not vote.³¹⁵ Further work on capacity building, technical assistance and transfer of technology, as well as finalization of guidelines to accompany the EEDI and SEEMP, was left to MEPC 63. The discussion on MBMs also remained divisive and did not advance further.

MEPC 63 was similarly divided on the issue of capacity building and technology transfer and failed to adopt a resolution on the topic, despite its significance and expectations that it would accompany the Annex VI amendments.³¹⁶ The EEDI and SEEMP guidelines to facilitate implementation were also not completed. There were several issues related to both the EEDI and SEEMP that required future MEPC attention. Discussion on MBMs continued with respect to assessment of impacts of such measures, possible consolidation of the various proposals, climate finance and use of MBM revenue, and relationship between MBMs and world trade rules. A more in-depth understanding of the direct and indirect impacts of MBMs on developing countries was needed.³¹⁷ A study conducted by India suggested that fuel price increases as a result of an MBM could have a substantial impact on

that country's oil, iron ore and coal trades.³¹⁸ Views differed on whether MBMs were needed, whether the various proposals should be consolidated to enable focus, and whether the EEDI should be used as a basis for an MBM. A working group had identified several possible uses for MBM revenues.³¹⁹ However, there were widely divergent views on how revenues from an MBM in shipping might be used and whether there should be a relationship to similar efforts under the UNFCCC, even though international shipping had been listed as one of the possible sources for climate finance.³²⁰ While some delegations saw no incompatibility between an MBM and WTO rules, others expressed caution as they perceived inconsistency issues.³²¹

Discussions on a resolution on capacity building and technology transfer continued, but were not concluded at MEPC 64. In consequence, and at the behest of states that felt further discussion on MBMs could not progress before adoption of the resolution, the committee postponed further deliberation to MEPC 65.³²² The progress to be observed at MEPC 64 related to the continued development of the guidelines for the implementation of the EEDI and SEEMP.

MEPC 65 finally found consensus on a controversial resolution — Promotion of Technical Co-operation and Transfer of Technology relating to the Improvement of Energy Efficiency of Ships — but only after informal consultations undertaken by the committee chair.³²³ The key issues that needed to be addressed were CBDR, transfer of technology and financing. Consensus was reached without any mandatory stipulations and essentially providing a framework for the IMO to offer technical assistance and for member states to promote support for other states.³²⁴ An Ad Hoc Expert Working Group on Facilitation of

312 MEPC 61 Report, *supra* note 306 at 48.

313 *Ibid*, annex 8. See also *Market-Based Measures – Inequitable Burden on Developing Countries*, Submitted by India, IMO Doc MEPC 61/5/19 (2 August 2010); *Uncertainties and Problems in Market-based Measures*, Submitted by China and India, IMO Doc MEPC 61/5/24 (5 August 2010).

314 *Report of the Drafting Group on Amendments to Mandatory instruments (Part II)*, IMO Doc MEPC 62/WP.11/Add.1 (15 July 2011).

315 *Report of MEPC on its 62nd Session*, IMO Doc MEPC 62/24 (26 July 2011) at 57 [MEPC 62 Report]. Several states made statements, reproduced in *Report of the MEPC on its 62nd Session*, IMO Doc MEPC 62/24/Add.1 (26 July 2011), annex 17.

316 *Report of the MEPC on its 63rd Session*, IMO Doc MEPC 63/23 (14 March 2012) at 32 [MEPC 63 Report].

317 *Ibid* at 36–38.

318 *Market Based Measures – Impact on India's Shipping Trade*, Submitted by India, IMO Doc MEPC 63/5/8 (23 December 2011) [MEPC 65/3/8].

319 Namely: "(1) incentivizing shipping to achieve improved energy efficiency; (2) offsetting – purchase of approved emission reduction credits; (3) providing a rebate to developing countries; (4) financing adaptation and mitigation activities in developing countries; (5) financing improvement of maritime transport infrastructure in developing countries (e.g., Africa); (6) supporting R&D to improve energy efficiency of international shipping; and (7) supporting the Organization's Integrated Technical Co-operation Programme." MEPC 63 Report, *supra* note 316 at 42.

320 *Ibid* at 41–42.

321 *Ibid* at 43.

322 *Report of the MEPC on its 64th Session*, IMO Doc 64/23 (11 October 2012) at 37–38 [MEPC 64 Report].

323 MEPC 65 Report, *supra* note 18 at 23, annex 4.

324 *Ibid*, annex 4.

Transfer of Technology for Ships was established to assess impacts of the implementation of the new Chapter 4 of MARPOL Annex VI and to maintain a list of green technologies and identify ways of access.³²⁵ Developed states secured the protection of intellectual property rights. Implementation action would start at MEPC 66. This consensus should have led to further deliberations on MBMs, but that was not to be. Instead, MEPC 65 suspended further discussion on MBMs to an undetermined future session.³²⁶ Perhaps this decision was not a total surprise as the committee remained divided on MBMs, even though there was progress on technical and operational initiatives, albeit not always on the basis of consensus.

In contrast, work on the finer details of the EEDI and SEEMP continued in a productive manner at MEPC 65. Through its working groups and in plenary, the committee resolved numerous outstanding technical issues, such as the computation of the EEDI for different classes of ships such as cruise ships, cargo ships, LNG carriers, ro-ro (roll-on/roll-off) cargo ships and ro-ro passenger ships, vehicle carriers and distinguished vessels running dual fuel engines. Accordingly, the guidelines to accompany the EEDI and SEEMP were finally completed and readied for adoption at MEPC 65 and 66.³²⁷ Amendments to Chapter 4 were already needed, in particular to exempt polar-class vessels with independent icebreaking capability from EEDI because of their considerably higher installed power and inability to meet that standard.³²⁸ There were other proposals for further action to enhance energy efficiency of ships, but the committee left that discussion for the next session.

With debates on MBMs on hold and work on Annex VI, Chapter 4, guidelines largely completed, the MEPC 66's attention turned to implementation of the resolution on technology transfer and capacity building, continued follow-up work on Chapter 4 guidelines and preparations for a third IMO GHG study, and worked on the proposal to set up an EEDI database. The Ad Hoc Expert Working Group on Facilitation of Transfer of Technology for Ships was established and its first meeting

³²⁵ *Ibid.*

³²⁶ *Ibid* at 44.

³²⁷ *Ibid* at 41–42. The 2014 Guidelines on the Method of Calculation of the Attained Energy Efficiency Design Index (EEDI) for new ships were adopted at MEPC 66: *Report of the MEPC on its 66th Session*, IMO Doc 66/21 (25 April 2014) at 25, annex 5 [MEPC 66 Report].

³²⁸ MEPC 65 Report, *supra* note 18 at 32. This was an issue flagged by Canada, Finland and Sweden.

convened.³²⁹ It was further able to report on its initial activities at MEPC 67.³³⁰ MEPC 67 also continued work on conceptualizing the database and updating and reviewing EEDI guidelines.³³¹ There was no progress on the discussion to explore additional operational energy efficiency standards for ships accompanied by metrics.³³²

The Third IMO GHG Study was completed in 2014 and presented at MEPC 67.³³³ The study noted that CO₂ emissions from shipping were projected to increase significantly. The business-as-usual scenarios projected an increase of between 50 percent and 250 percent by 2050, although enhancement of energy efficiency and reduced emissions had the potential to mitigate the increase to some extent. Efficiency improvements were important, but the study concluded that “even modelled improvements with the greatest energy savings could not yield a downward trend. Compared to regulatory or market-driven improvements in efficiency, changes in the fuel mix have a limited impact on GHG emissions, assuming fossil fuels remain dominant.”³³⁴

An ongoing key concern was the absence of reliable ship emissions data to facilitate adoption of further technical and operational measures to enhance energy efficiency in international shipping. The data issue was first flagged at MEPC 63,³³⁵ and at MEPC 66 it was agreed that a Ship Fuel Consumption Database would assist the IMO in its future reviews of technological developments and in determining CO₂ emissions. The debate was continued in successive sessions because the information required to determine energy efficiency could be detailed with respect to the transport work undertaken, rather than simply relate to the fuel consumed. In turn, efficiency data potentially raised sensitive issues of commercial competitiveness if the raw data were to be made publicly available.³³⁶ Other issues included whether reporting should be mandatory, vessel size for reporting, impact

³²⁹ MEPC 66 Report, *supra* note 327 at 26–28.

³³⁰ *Report of the MEPC on its 67th Session*, IMO Doc 67/20 (31 October 2014) at 25–26.

³³¹ *Ibid* at 26, 29–30.

³³² *Ibid* at 33.

³³³ *Third IMO GHG Study 2014 – Executive Summary*, Note by the Secretariat, IMO Doc MEPC 67/6 (1 July 2014), annex [Third IMO GHG Study].

³³⁴ *Ibid*, annex at 13.

³³⁵ MEPC 63 Report, *supra* note 316 at 46.

³³⁶ *Report of the MEPC on its 68th Session*, IMO Doc 68/21 (29 May 2015) at 36–38 [MEPC 68 Report].

on different cargoes carried, impact of change of ship ownership or registration and responsibility for transferring data to the flag state.³³⁷

As observed earlier, the slow pace of work on GHG regulation at the IMO triggered EU pressure. The European Union welcomed the EEDI and the SEEMP, but considered these measures insufficient because they would not lead to an absolute emissions reduction of GHGs from international shipping.³³⁸ The European Union agreed that a global CO₂ data collection system for international shipping was a necessary step, and had in fact proceeded to adopt the EU MRV³³⁹ as an example of what a global system could look like. The data included detailed emission and transport efficiency, with an effective enforcement date in European ports of January 1, 2018. The European Union is currently considering the appropriateness of the alignment of its MRV scheme with the IMO data collection system. The effect of the MRV initiative was to exert regional pressure for global action, which materialized at MEPC 70 by an amendment to Annex VI introducing a mandatory global data collection system for reporting data on ships' annual fuel consumption for ships of 5,000 GT and over.³⁴⁰ These ships are thought to account for 85 percent of all GHG emissions from international shipping.³⁴¹ With entry into force in 2018, reporting of data will start in 2020.³⁴²

On the eve of the Paris Climate Change Conference, at MEPC 68, the Marshall Islands, both a SIDS state and one of the largest open register states, proposed that the IMO commence work to establish a GHG emissions reduction target consistent with keeping global warming below 1.5°C and to

agree on the measures necessary to reach that target.³⁴³ The question whether emissions from international shipping should have a defined emissions reduction target has been an ongoing issue in MEPC deliberations across sessions. The ensuing debate reflected the broad diversity of views that had characterized past GHG discussions in the IMO.³⁴⁴ It was recognized that more could be done at the IMO, because while substantial efforts were invested into enhancing energy efficiency to reduce emissions and establishing a database, the Third IMO GHG Report did not paint a rosy picture on the sufficiency of such measures. The remaining issues concerning the proposed mandatory data collection system for fuel consumption of ships were resolved at MEPC 69 and amendments to integrate the system into the new Chapter 4 of Annex VI approved, paving the way for tacit acceptance.³⁴⁵ Guidelines to facilitate administration of the database and implementation of the regulation were adopted at MEPC 71.³⁴⁶

The Paris Climate Conference in December 2015 may have provided the IMO a breath of relief by tacitly leaving the determination of the international shipping industry's contribution to GHG emissions reductions to the IMO for the time being. But it also renewed debate in the IMO as to the organization's long-term GHG vision and how it should proceed in developing the industry's fair contribution. In a post-conference debate at the IMO, it was clear that although the IMO had for years worked on and developed a framework for energy efficiency to reduce CO₂ emissions, much more was expected.³⁴⁷ The IMO would need to develop, and be seen to adopt, meaningful measures that would be periodically reviewable. That international trade should not be undermined by new measures, and the need for developing countries (especially SIDS and LDCs) to have access to financial resources and technology, were underscored. Reconciliation of CBRD and NMFT had to be addressed. However, there were those who felt the IMO should stay its course on the database and, following its operationalization, use its data to proceed with

337 *Report of the Working Group*, IMO Doc MEPC 68/WP.10 (13 May 2015).

338 *Development of a Global Data Collection System for Maritime Transport*, submitted by Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, the United Kingdom and the European Commission, IMO Doc MEPC 68/4/1 (3 March 2015) at 3.

339 *EU MRV*, *supra* note 148.

340 *Amendments to MARPOL Annex VI (Data Collection System for Fuel Oil Consumption of Ships)*, 28 October 2016, IMO Doc MEPC 70/18/Add.1 (entered into force 1 March 2018), annex 3. The flag state has the responsibility to monitor, report and issue a statement of compliance to its ships and transfer the reported data to the IMO Ship Fuel Consumption Database.

341 IMO, Press Briefing, "New Requirements for International Shipping as UN Body Continues to Address Greenhouse Gas Emissions" (28 October 2016), online: IMO <www.imo.org/en/MediaCentre/PressBriefings>.

342 *Consideration of the Report of the MEPC, Note by the Secretary-General*, IMO Doc C 117/7 (16 November 2016) [Council 117]. Reporting guidelines are in preparation.

343 *Setting a Reduction Target and Agreeing Associated Measures for International Shipping*, Submitted by the Marshall Islands, IMO Doc 68/5/1 (20 March 2015).

344 *MEPC 68 Report*, *supra* note 336 at 41–44.

345 *Report of the MEPC on its 69th Session*, IMO Doc 69/21 (13 May 2016) at 33 [MEPC 69 Report].

346 *Resolution MEPC.292(71) – 2017 Guidelines for Administration Verification of Ship Fuel Oil Consumption Data*, in *Report of the MEPC on its 71st Session*, IMO Doc MEPC 71/17 (24 July 2017), Annex 16.

347 *MEPC 69 Report*, *supra* note 345 at 35–38.

analysis and eventual decision making on a long-term plan. Industry interests felt the IMO approach should retain flexibility and consider aspirational rather than legally binding targets. It was felt important to ensure the measures adopted to date, such as the EEDI and technology transfer and capacity- building measures, be implemented first. Past differences of views persisted, but the organization opted for a disciplined approach. The discussion concluded by recognizing that priority should continue to be given to the data collection system and for further work to proceed on the three-step approach of maritime regulation: data collection; analysis; and decision making.

Convened in the wake of the Paris Agreement, MEPC 70 was under pressure to demonstrate a game plan for the orchestration of the international shipping industry's contribution to the global response to climate change. An industry proposal³⁴⁸ was used as the basis for the committee's adoption of the Roadmap for Developing a Comprehensive IMO Strategy on Reduction of GHG Emissions from Ships.³⁴⁹ The roadmap consists of further GHG studies, intersessional work subject to timelines, and ongoing committee work on ship energy efficiency improvements. The initial GHG reduction strategy will be adopted in 2018 and will lead to a revised strategy in 2023 to include a range of measures and implementation schedules over the short, medium and long term.³⁵⁰ MEPC 70 also adopted the finalized mandatory data collection system for fuel oil consumption of ships, the 2014 guidelines were amended and guidelines for calculation of the EEDI were updated.

For MEPC 71, the committee had before it numerous new submissions by member states and organizations with consultative status, submitted to the committee directly, as well as to ISWG-GHG 1. The ISWG-GHG 1 met in June 2017 for intensive discussions on the directions for the strategy and work plan for consideration at MEPC 71. Following consideration of submissions and the ISWG-GHG 1 report, the committee adopted the latter's proposals, including the outline proposed for the initial strategy developed

at a parallel meeting during MEPC 71.³⁵¹ The proposed outline became the template of the initial IMO strategy adopted by MEPC 72:

- preamble/introduction/context, including emission scenarios;
- vision;
- levels of ambition;
- guiding principles;
- list of candidate short-, mid- and long-term further measures with possible timelines and their impacts on states;
- barriers and supportive measures; capacity building and technical cooperation;
- research and development (R&D);
- follow-up actions toward the development of the revised strategy; and
- periodic review of the strategy.

In using this outline as a basis of work at subsequent intersessional meetings (October 2017 and April 2018), the MEPC further instructed the working group to consider the substantive issues set out in submissions by various delegations and organizations with consultative status and to submit a progress report in 2018. The ISWG-GHG 2 concluded its meeting in October 2017 and commenced to populate the strategy.³⁵² The importance of the issue was demonstrated by the participation of 59 member state delegations and other associate members and organizations with consultative status. As before, the meeting continued to evidence fundamental differences on the core elements of the strategy, in particular on vision, levels of ambitions and guiding principles.

The initial IMO strategy was adopted by MEPC 72 in April 2018 as proposed by ISWG-GHG 3 on the basis of overwhelming support from member states, despite the continuing reservations expressed. The strategy advances a long-term "best endeavours" commitment with a vision statement that "IMO remains committed to reducing GHG emissions

³⁴⁸ *Development of a Road Map to Determine a Possible IMO Fair Share Contribution*, Submitted by BIMCO, ICS, INTERCARGO, INTERTANKO and WSC, IMO Doc MEPC 70/7/8 (19 August 2016).

³⁴⁹ *Report of the MEPC on its 70th Session*, IMO Doc MEPC 70/18 (11 November 2016) at 50–51; *Report of the MEPC on its 70th Session*, IMO Doc MEPC 70/18/Add.1 (11 November 2016), annex 11; see ISWG-GHG 1 Report, *supra* note 19.

³⁵⁰ Council 117, *supra* note 342.

³⁵¹ *Report of the MEPC on its 71st Session*, IMO Doc 71/17 (24 July 2017) at 48–49 [MEPC 71 Report].

³⁵² *ISWG-GHG 2 Report*, *supra* note 19. See also "Progress Made in Developing GHG Strategy for International Shipping" IMO Briefing (30 October 2017) online: IMO <<https://docs.imo.org/Common/NewsItem.aspx?id=aa6bd907-2ab4-429a-82aa-b2208e44b212>>.

from international shipping and, as a matter of urgency, aims to phase them out as soon as possible in this century.”³⁵³ The accompanying objectives include contribution to global mitigation efforts under the climate regime and pursuit of SDG 13, identification of actions to be implemented in shipping while taking into consideration impacts on states and the role of shipping in global trade, and identification of related actions and measures, including R&D and monitoring of GHG emissions.

The significant differences on levels of ambition were bridged through the efforts of the ISWG chair.³⁵⁴ First, the expectation is that the carbon intensity of ships would decline as a result of ratcheting up the EEDI for new ships. Second, the carbon intensity of shipping would decline to reduce average carbon emissions across the transport industry by at least 40 percent by 2030 and aiming for 70 percent by 2050, compared to the 2008 base year. Third, GHG emissions would peak and decline to reduce annual GHG emissions by at least 50 percent by 2050 compared to 2008, while pursuing further efforts consistent with the Paris Agreement goals. There was agreement on 2008 as the base year in determining future emissions reductions and this reflected the common understanding in the working group.³⁵⁵ In comparing data between 2007 and 2012, the Third IMO GHG Study appeared to suggest that 2008 was the peak year for CO₂ emissions.³⁵⁶

The longstanding controversy concerning the guiding principles was resolved by ensuring that the strategy’s principles reflected both IMO and UNFCCC principles, not a small achievement considering the competing proposals.³⁵⁷ The

compromise includes both non-discrimination and NMFT regardless of flag in the IMO conventions and CBDR-RCNC in the climate regime.³⁵⁸ The adopted principles further include impacts on states, especially the LDCs and SIDS and “the need for evidence-based decision-making balanced with the precautionary approach.”³⁵⁹ The discussion in the working group had considered an articulation of the CBDR that would include emphasis on developed country lead, geographical considerations, low-value cargo, transportation costs, routes, phasing-in and readiness, and this is now reflected in parts of the strategy dedicated to impacts on states and barriers.³⁶⁰ Discussion on whether the strategy should be in-sector, so that international shipping would not become a source for general climate finance outside the sector,³⁶¹ was not reflected in the strategy.

Despite the substantial differences with respect to measures, the strategy reflects convergence on a range of measures for the short-, medium- and long-term periods.³⁶² As adopted, the strategy includes short-term measures finalized in the 2018–2023 period, followed by medium-term measures in 2023–2030 and long-term measures after 2030, with the effective date of each measure to be determined and while anticipating that some short- and medium-term measures could commence prior to 2023. An initial and non-exhaustive list of measures is set out in the strategy. Measures are conceived in terms of their direct application to ships as distinct from a supportive function they may play. Some measures are based on enhancement of existing regulation and practices (for example, ratcheting up of the EEDI and SEEMP, other technical and operational energy efficiency measures, existing fleet improvement, speed management, and management of methane and volatile organic compound emissions). These measures are familiar in the industry and therefore likely to be implemented in the short term. Other short-term measures can be described as facilitative to enhance infrastructure and capacity to enable GHG emissions reductions (for example, development of national action plans, technical cooperation, port measures, R&D, incentives for first movers, GHG/

353 ISWG-GHG 2 Report, *supra* note 19, annex at 4; *Initial IMO Strategy*, *supra* note 20 at para 2.

354 ISWG-GHG 2 Report, *supra* note 19, annex at 4–6; *Initial IMO Strategy*, *supra* note 20 at para 3.1.

355 For example, Japan proposed short- to mid-term goals to improve energy efficiency 40 percent over 2008 by 2030 and a long-term goal to reduce net CO₂ emissions by 50 percent over 2008 by 2060. Belgium and others proposed a target of at least 70 percent while pursuing efforts to achieve 100 percent reduction by 2050, compared to 2008. *Ibid* at 9.

356 *Third IMO GHG Study*, *supra* note 333 at 1.

357 The first two competing options for principles were the nine MEPC 57 principles (ISWG-GHG 2 Report, *supra* note 19, annex at 7–8), and 10 separate principles submitted by Argentina, Brazil, China, Ecuador, India, Nigeria, Saudi Arabia, South Africa and Turkey at MEPC 71, which included coherence with the UNFCCC regime, alignment with the Sustainable Development Goals and no trade barriers (*Ibid*, annex at 8). The third option was the eight principles identified in ISWG-GHG, namely: ambitious and evidence-based; ensure the sustainable growth of the international shipping sector; avoid regional or unilateral measures; inclusive in addressing member states’ concerns; flexible in accommodating sectoral developments; supportive of innovation and R&D; cost-effective, practical and easy to administer; and recognition of early actions (ISWG-GHG 2 Report, *supra* note 19 at 8 and 19).

358 *Initial IMO Strategy*, *supra* note 20 at para 3.2.

359 *Ibid*.

360 ISWG-GHG 2 Report, *supra* note 19, annex at 8–9; *Initial IMO Strategy*, *supra* note 20, paras 4.10 and 5.

361 ISWG-GHG 2 Report, *supra* note 19, at 8.

362 *Initial IMO Strategy*, *supra* note 20 at para 4.1.

carbon intensity guidelines, undertaking of studies and better presentation of the IMO and its work on this subject). The medium- and long-term measures essentially build on the short-term measures and the lessons learned while exploring new measures, supported by technological developments. These include low-carbon and zero carbon fuels and “new/innovative emission reduction mechanism(s), possibly including Market-based Measures (MBMs), to incentivize GHG emission reduction.”³⁶³ Considering the concerns expressed in earlier MEPC deliberations, it is interesting to observe that MBMs have been included as potential measures to achieve significant GHG emissions reductions in the event technical and operational measures do not deliver sufficient reductions.

Of crucial importance, the revised strategy (to be adopted in 2023) will be subject to periodic review every five years after adoption.³⁶⁴ Ideally, such reviews should coincide with the global stocktake to ensure that efforts under IMO and the climate regime are in synch. This may have to be determined in the revised version of the strategy as the MEPC will need to define the scope and terms of the review. In the meantime, the IMO recognized that it was necessary to continue its work on the initial strategy to address the many concerns and reservations expressed at MEPC 72. The MEPC agreed to convene the fourth meeting of the ISWG-GHG to develop a program of follow-up actions for the strategy, consider how to advance GHG emissions reductions and to report to MEPC 73 in October 2018.³⁶⁵

In summary, the substantive regulatory achievements with respect to GHGs, and specifically CO₂, to date consist of 2011 amendments to MARPOL Annex VI, introducing a new Chapter 4 setting out the EEDI for mandatory new ships and the SEEMP for all ships, and accompanied by guidelines,³⁶⁶ both of which are discussed further below, as well as a mandatory data collection system for oil fuel consumption. These measures are expected to render all new ships 30 percent more energy efficient by 2025 than those built in 2014, and mandatory reporting for vessels of 5,000 GT or more of oil fuel use to flag states and thereby to the IMO to

commence in 2020. Although not yet a regulatory achievement, the initial IMO strategy sets out a framework for a provisional pathway for potential future regulation. Couched in compromise text, it is short on detail and the task to develop specific actions will be discharged by ISWG-GHG 4.

Range of Actual and Potential Measures Considered

General

The categories of GHG emissions reduction measures considered to date by the IMO for the maritime sector consist of technological, operational and MBMs. Technical and operational measures provide an incentive for shipowners to comply because of the greater operational efficiency likely to be achieved. Enhanced efficiency translates into lower fuel consumption and leads in turn to lower operating costs. To some extent, this is the “invisible hand” of the market at work, but it is limited in its utility, as shipowners will only invest voluntarily in technical and operational measures to the extent that they expect to realize a beneficial return. MBMs are different because they attempt to internalize costs through various tools, including levies, trading schemes and offsets, to induce shipowners to reduce emissions according to prescribed standards.³⁶⁷ By promoting the internalization of costs, they constitute a potentially useful tool for the implementation of the “polluter pays” principle. Moreover, some MBMs, such as levies, generate revenue, which may be diverted by an administering body to further the goals of the strategy. The work of the IMO with respect to these measures is discussed next.

Technical and Operational Measures

Technical and operational measures are closely interrelated. Generally, technical measures relate to the standards of construction and equipping of a ship and usually entail long-term investments in the form of retrofitting and new builds. Examples include new hull designs, new propulsion machinery using cleaner fuels and new propeller technology that enhances mobility efficiency. Operational measures concern how a vessel is in fact operated while trading or in port,

³⁶³ *Ibid* at para 4.8.

³⁶⁴ *Ibid* at para 7.

³⁶⁵ MEPC 72 Report, *supra* note 20 at 44.

³⁶⁶ 2014 Guidelines on Survey and Certification of the Design Index (EEDI), IMO Doc MEPC.1/Circ.855/Rev.1 (8 October 2015) and 2013 Interim Guidelines for Determining Minimum Propulsion Power to Maintain the Manoeuvrability of Ships in Adverse Conditions, IMO Doc MEPC.1/Circ.850/Rev.1 (15 July 2015).

³⁶⁷ For a more detailed technical discussion of MBMs and their interplay with marginal abatement curves, see Harilaos N Psarftis, “Market-based Measures for Greenhouse Gas Emissions from Ships: A Review” (2012) 11:2 WMU J Maritime Affairs 211 at 213–15.

and can usually be implemented in the short term. Examples include speed optimization, weather routing and hull maintenance. MARPOL Annex VI, Chapter 4, sets out technical and operational measures for vessels of 400 GT, with an effective date of January 1, 2013. The key regulations concern the EEDI as a technical measure for new ships and the SEEMP as an operational measure for existing ships. Collectively, these measures seek to increase the operating efficiency of ships on international routes, thereby reducing fuel consumption and overall GHG emissions in the sector.

In applying to new builds, the EEDI concerns vessels ordered as of January 1, 2017, or those to be delivered after July 1, 2019. The EEDI also automatically applies to older ships that have undergone major conversions from 2017 onward.³⁶⁸ The EEDI applies differently to the various classes of vessels, namely bulk carriers, gas carriers, tankers, container ships, general cargo ships, refrigerated cargo carriers, combined carriers, LNG carriers, ro-ro cargo ships (vehicle, general carriers, passenger), cruise passenger ships and non-conventional propulsion vessels, and in accordance with transitional regulatory phasing set out in a regulation.³⁶⁹ Every class of ship is assigned an attained EEDI that indicates an estimate of its real performance with regard to its required EEDI. The required EEDI for a vessel is based on a “reduction factor” as well as its reference line value.³⁷⁰ Reduction factors vary with the type and size of each vessel, becoming more stringent over time with each five-year phase leading up to 2025. Reference line values are based on ship type and size. Both reduction factors and reference line values are subject to amendment based on technological developments. Changes in the market, such as a surge or further decline in the price of oil, are not explicitly contemplated by the regulations. It is conceivable that market changes might push shipowners to increase operating efficiency beyond what is merely required of them. The approach of the EEDI is non-prescriptive and instead it embraces a performance-based approach. Effectively, and flexibly, this approach leaves the choice of technologies to achieve stated efficiency goals to the shipowner.

The value of the SEEMP is that its scope of application is all ships, therefore including existing ships that are likely not as efficient as new builds. The SEEMP requirement is accompanied by guidelines to facilitate its implementation.³⁷¹ All ships are required to have a plan to enhance operational efficiency with respect to the particular ship’s capabilities. It is understood that ships have different classes and operate under a wide variety of conditions. Through the SEEMP, the shipowner, operator or charterer aim to improve a ship’s energy efficiency through planning, implementation, monitoring, and self-evaluation and improvement, thus completing a feedback cycle.³⁷²

To facilitate proper functioning of the EEDI and SEEMP models, MARPOL Annex VI incorporates a mechanism to facilitate the collection and reporting of fuel consumption data. Data is collected yearly by the flag state and transmitted to the IMO, with each ship’s performance anonymously catalogued by the IMO and distributed among member states for their consideration and analysis.³⁷³

The MARPOL Annex VI, Chapter 4, includes provision for promotion of technical cooperation and transfer of technology relating to the improvement of energy efficiency of ships, based on state request.³⁷⁴ This provision was included to address the concerns raised by developing countries with respect to the need for capacity building. As will be seen below, while this provision is built on good intentions, it faces the challenge of intellectual property rights, which are not readily transferred by commercial actors seeking to maintain market competitiveness. These issues have been the focus of some of the efforts to address the role of technology and technology transfer under the UN climate regime. The technology mechanism was first announced under the Copenhagen Accord, but has since been brought under the Paris Agreement, and work continues on the development and dissemination of climate-related technologies.

MBMs

As discussed above, the decision to consider MBMs as potential mechanisms for curbing GHG emissions in the international shipping sector, in

³⁶⁸ See MARPOL, *supra* note 10, annex VI, c 4, reg 19.5.

³⁶⁹ *Ibid.*, annex VI, c 4, reg 21.

³⁷⁰ *Ibid.*, annex VI, c 4, reg 21, tables 1 and 2.

³⁷¹ *Ibid.*, reg 22.3. See *Guidance for the Development of a Ship Energy Efficiency Management Plan (SEEMP)*, IMO Doc MEPC.1/Circ.683 (17 August 2009).

³⁷² *Ibid.*

³⁷³ MARPOL, *supra* note 10, annex VI, c 4, reg 22A.

³⁷⁴ *Ibid.*, reg 23.

addition to other measures, was first made in an IMO Assembly resolution in 2003.³⁷⁵ Starting with the fifty-fourth session, the MEPC considered MBMs through its working groups until discussion of the topic was suspended at MEPC 65. As observed in the commentary above, the discussions revealed significant divisions. While the majority agreed on the merits of the concept, several delegations expressed concerns with regard to uncertain or adverse impacts on developing countries, fearing that an MBM could adversely affect their trade and development. The Bahamas, Brazil, China, India, Peru, Saudi Arabia and South Africa, among others, voiced concerns on these issues. Despite the suspension of formal discussions, member states made further proposals and in MEPC 72, MBMs were included as conceivable measures for the medium term in the initial IMO strategy.

There are several options for MBMs. Following the initial MBM proposal of the United Kingdom at MEPC 55, several other submissions that directly or indirectly supported MBMs were made at MEPC 59 and 60:

- Cyprus, Denmark, the Marshall Islands, Nigeria and the International Parcel Tankers Association (IPTA) proposed the establishment of an “International Fund for GHG Emissions from Ships,” based on a global reduction target for international shipping.³⁷⁶ Emissions in excess of the target would need to be offset through purchased and approved emissions reduction credits that would be based on a contribution paid on every tonne of bunker fuel purchased.
- Japan proposed a “Leveraged Incentive Scheme” based on contributions from bunker fuel purchases made to a GHG fund.³⁷⁷ A ship’s meeting or exceeding efficiency benchmarks would be rewarded through partial refunds.

³⁷⁵ Resolution A.963(23), *supra* note 239 at para 1(d).

³⁷⁶ *An International Fund for Greenhouse Gas Emissions from Ships*, Submitted by Cyprus, Denmark, the Marshall Islands, Nigeria and the International Parcel Tankers Association (IPTA), IMO Doc MEPC 60/4/8 (18 December 2009) [MEPC 60/4/8].

³⁷⁷ *Consideration of a Market-based Mechanism: Leveraged Incentive Scheme to Improve the Energy Efficiency of Ships Based on the International GHG Fund*, Submitted by Japan, IMO Doc MEPC 60/4/37 (15 January 2010) [MEPC 60/4/37].

- The United States proposed mandatory efficiency standards for all ships, and an efficiency credit trading program to induce compliance.³⁷⁸
- Norway proposed a cap-and-trade system with a sector-wide cap on net emissions and establishment of a global emissions trading/auctioning system.³⁷⁹
- A UK proposal was similar to Norway’s, but was based on a national rather than global auctioning system and with a long-term decreasing cap.³⁸⁰
- France proposed an emissions trading system similar to Norway’s, but with some different elements.³⁸¹
- Jamaica proposed a uniform consumed bunker-based levy applied to ships on port calls.³⁸²
- The World Shipping Council (WSC) proposed incremental mandatory efficiency standards for all new and existing ships according to their class, and a fee per tonne of fuel consumed would be levied from non-compliant ships.³⁸³
- The IUCN and WWF called for a rebate mechanism for a market-based instrument, while compensating developing countries for the MBM’s financial impact.³⁸⁴
- Germany proposed a tool to assess MBM impacts in the form of an “Impact Assessment of an Emissions Trading Scheme,” paying attention to impacts on developing countries.³⁸⁵

³⁷⁸ *Further details on the United States Proposal to Reduce Greenhouse Gas Emissions from International Shipping*, Submitted by the United States of America, IMO Doc MEPC 60/4/12 (14 January 2010) [MEPC 60/4/12].

³⁷⁹ *A Further Outline of a Global Emission Trading System (ETS) for International Shipping*, Submitted by Norway, IMO Doc MEPC 60/4/22 (15 January 2010) [MEPC 60/4/22].

³⁸⁰ *A Global Emissions Trading System for Greenhouse Gas Emissions from International Shipping*, Submitted by the United Kingdom, IMO Doc MEPC 60/4/26 (15 January 2010) [MEPC 60/4/26].

³⁸¹ *Further Elements for the Development of an Emissions Trading System for International Shipping*, Submitted by France, IMO Doc MEPC 60/4/41 (15 January 2010) [MEPC 60/4/41].

³⁸² *Achieving Reduction in Greenhouse Gas Emissions from Ships through Port State Arrangements Utilizing the Ship Traffic, Energy and Environment Model, STEEM*, Submitted by Jamaica, IMO Doc MEPC 60/4/40 (15 January 2010) [MEPC 60/4/40].

³⁸³ *Proposal to Establish a Vessel Efficiency System (VES)*, Submitted by the World Shipping Council, IMO Doc MEPC 60/4/39 (15 January 2010) [MEPC 60/4/39].

³⁸⁴ MEPC 60/4/55, *supra* note 301.

³⁸⁵ *Impact Assessment of an Emissions Trading Scheme with a Particular View on Developing Countries*, Submitted by Germany, IMO Doc MEPC 60/4/54 (29 January 2010) [MEPC 60/4/54].

At MEPC 62, the third ISWG-GHG organized the existing MBM proposals into two groups: those focusing on in-sector maritime emissions reductions; and those opting to focus on out-of-sector reductions, or offsetting.³⁸⁶ The group of MBMs focused on in-sector emissions reductions will best serve to drive and incentivize technological innovation by shipowners in order to increase efficiency within the shipping sector. Shipowners who fail to reach gradually increasing standards would be liable to pay a penalty of sorts, the proceeds of which would ultimately be used for administrative purposes, R&D, or mitigation of ill-effects on developing countries.

The group of MBMs focused on offsetting would, to some extent, integrate international shipping into the broader GHG emissions reduction effort. Shipowners would either purchase or be allotted emissions credits, which could be subsequently used, traded or potentially banked for later use. Additional credits would be available via out-of-sector offset programs. The many detractors of the out-of-sector model point out that while such a scheme, if managed properly, would ensure a net global reduction in GHG emissions, it might allow the shipping sector to stagnate technologically. Indeed, it gives shipowners greater opportunity to use redirected capital in the place of innovation. In principle, integration with or at least derivation from existing land-based emissions reductions schemes might serve to make a maritime solution easier to adopt initially and administer as time goes on.

Focus on In-sector Reductions

This group of MBM proposals is dominated by reliance on the EEDI. Two proposals that stand out are the joint proposal from Japan and the WSC, and the US proposal. The two proposals are strikingly similar. The first is known as the

Efficiency Incentive Scheme (EIS);³⁸⁷ the second, Ship Efficiency and Credit Trading (SECT).³⁸⁸ A third proposal, the Port State Levy, proposed by Jamaica,³⁸⁹ received less attention. The Bahamas, concerned about harm to developing countries and adamant that any MBM would represent a penalty on international trade, proposed non-intervention in the market, preferring to let natural market forces incentivize technological development and efficiency.³⁹⁰

The EIS imposes a baseline efficiency standard on individual ships of each class and size. Japan's view is that a global industry-wide cap would cause an outflow of money from the sector (more on this below in the discussion of the GHG Fund proposal). The baseline would increase in stringency over time, and it could be tied to the existing EEDI. Any ship not meeting its respective baseline would be charged a flat rate per ton of bunker fuel purchased. Thus, ships with an EEDI rating in compliance with the scheme would not be penalized, whereas those that underperformed would contribute to a global GHG shipping fund, the proceeds of which would be applied primarily to R&D. The SECT proposal from the United States is almost identical to the EIS, but differs in that it incorporates a credit

³⁸⁷ The EIS is a hybrid of a separate string of proposals, put forward by Japan and the WSC respectively. Japan put forward the following documents in support of its Leveraged Incentive Scheme: *Consideration of a Market-based Mechanism to Improve the Energy Efficiency of Ships Based on the International GHG Fund*, Submitted by Japan, IMO Doc MEPC 59/4/35 (8 May 2009); MEPC 60/4/37, *supra* note 377; *Consideration of a Market-based Mechanism: Leveraged Incentive Scheme to Improve the Energy Efficiency of Ships Based on the International GHG Fund (Corrigendum)*, Submitted by Japan, IMO Doc MEPC 60/4/37/Corr.1 (16 March 2010). In support of its Vessel Efficiency System, the WSC submitted a proposal, MEPC 60/4/39, *supra* note 383. The two proposals were officially merged by *Efficiency Incentive Scheme (EIS)*, Submitted by Japan and the WSC, IMO Doc MEPC 63/5/3 (25 November 2011). This unified proposal was elaborated upon by the following documents: *Cost Analysis on the Application of Efficiency Improvement Measures in the Maritime Fleet*, Submitted by Japan, IMO Doc MEPC 63/INF.13 (22 December 2011); *Draft Legal Text on the Modified Efficiency Incentive Scheme (EIS)*, Submitted by Japan, IMO Doc MEPC 64/5/2 (28 June 2012); *Schematic Outline of the Modified Efficiency Incentive Scheme (EIS)*, Submitted by Japan, IMO Doc MEPC 64/INF.15 (27 July 2012).

³⁸⁸ *Comments on MEPC 59/4/2 and MEPC 59/4/4 and an Additional Approach to Addressing Maritime GHG Emissions*, Submitted by the United States, IMO Doc MEPC 59/4/48 (22 May 2009); MEPC 60/4/12, *supra* note 378; *Further Details on the United States Proposal to Reduce Greenhouse Gas Emissions from International Shipping*, Submitted by the United States, IMO Doc MEPC 61/5/16 (23 July 2010); MEPC 61/INF.24, *supra* note 304.

³⁸⁹ MEPC 60/4/40, *supra* note 382; *Elaboration on the Port State Levy Proposal*, Submitted by Jamaica, IMO Doc MEPC 64/5/4 (10 July 2012).

³⁹⁰ *Market-based Instruments: A Penalty on Trade and Development*, Submitted by the Bahamas, IMO Doc MEPC 60/4/10 (13 January 2010); *Mandatory CO₂ Emission Cut Targets through Technical and Operational Measures*, Submitted by the Bahamas, IMO Doc MEPC 62/5/13 (6 May 2011); *Draft Regulations to be Included in MARPOL Annex VI for the Control of CO₂ Emissions from Ships*, Submitted by the Bahamas, IMO Doc MEPC 63/5/1 (24 November 2011).

³⁸⁶ *Report of the Third Meeting of the Intersessional Working Group on Greenhouse Gas Emissions from Ships*, Submitted by the Secretariat, IMO Doc MEPC 62/5/1 (8 April 2011) at 16–17. See annex 3 of the same document for the grouping of each proposed MBM.

trading system. In short, vessels that outperform their respective baselines would sell emissions credits to vessels that fail to reach theirs.

The US proposal incentivizes not only the achieving of baselines, but also *exceeding* them. However, a credit trading system will introduce inherent complexities of its own; for example, the price of credits will not necessarily remain stable or predictable. Further, if credits are not available in sufficient quantities, it is unclear what options would be available for underperforming ships.

Reliance of an MBM on the EEDI could pose an issue for older vessels, which may be disproportionately penalized. A potential approach to alleviate the issue would have to balance the obvious desirability of existing ships serving out their full intended service lives while still being pushed to operate as efficiently as possible and perhaps even being retrofitted to some degree. A further issue is that, under the EEDI, underpowered ships often achieve a high rating, whereas vessels that rely on substantial power to operate are at a disadvantage. A ship's energy efficiency should not be the sole criterion upon which to base an MBM, as it could cause inequity in some trades. The reality is that some routes are less profitable than others. Narrow margins, coupled with a monetary penalty, may thus reduce traffic to some regions.

The Jamaican proposal of a Port State Levy appears as a decentralized MBM. It would involve a uniform fee charged by individual port states on ships entering their ports. This fee would be based on fuel consumed during the inbound voyage and could be structured toward global emissions reduction targets, rewarding vessels that exceed targets. The revenues from this scheme could be applied to purchase out-of-sector offsets for the shipping industry or may allow for keeping revenues within the sector. While such a system would arguably be simpler than a credit trading system, it would also burden port states and potentially result in uneven application.

Focus on Out-of-sector Reductions

Proposals in this category included the GHG Fund proposed by Cyprus, Denmark, the Marshall

Islands, Nigeria and the IPTA,³⁹¹ supported by South Korea and Liberia,³⁹² and the Global Emissions Trading Scheme, proposed by France, Norway and the United Kingdom.³⁹³ Germany released a relatively favourable impact assessment of the ETS on developing countries and recommended that a portion of revenues be redistributed among them to mitigate any negative effects.³⁹⁴

The GHG Fund would impose a levy on each ton of bunker fuel and establish a global emissions reduction target for the entire shipping sector. Emissions beyond this cap would be offset by a scheme in which emissions reduction credits would be issued to shipowners who funded out-of-sector GHG emissions reductions projects. The levy could be adjusted regularly to ensure sufficient funding for the payment of emissions reduction credits to shipowners. Additional funds could be allocated to mitigation of negative effects on the developing world, R&D, adaptation and technical cooperation. While the GHG Fund is preferable to industry investors in that it would, to some extent, ensure stability of fuel and carbon prices, problems emerge when one considers how and where to set the industry target. Furthermore, shipowners are encouraged to spend money out-of-sector just as readily as they are encouraged to spend it on technological development and efficiency in-sector.

³⁹¹ *The Feasibility of an International Compensation Fund for GHG Emissions from Ships*, Submitted by Denmark, IMO Doc MEPC 58/4/22 (14 August 2008); *An International Fund for Greenhouse Gas Emissions from Ships*, Submitted by Denmark, IMO Doc MEPC 59/4/5 (9 April 2009); MEPC 60/4/8, *supra* note 376; *Effects on Sea Transport Cost Due to an International Fund for GHG Emission for Ships*, Submitted by Denmark, IMO Doc MEPC 60/INF.7 (18 December 2009).

³⁹² *The International Greenhouse Gas Fund – Strengths and Weaknesses*, Submitted by Cyprus, Denmark, the Marshall Islands, Liberia, Nigeria, the Republic of Korea and the International Parcel Tankers Association (IPTA), IMO Doc MEPC 62/5/33 (20 May 2011).

³⁹³ The originating document for the ETS was: *Comments on the Outcome of GHG-WG 1 Regarding the Consideration of an Emission Trading Scheme for International Shipping*, Submitted by France, Germany and Norway, IMO Doc MEPC 58/4/25 (15 August 2008). Norway and France both returned with their own proposals at later sessions, with the United Kingdom ultimately joining them: MEPC 60/4/22, *supra* note 379; MEPC 60/4/41, *supra* note 381; MEPC 60/4/26, *supra* note 380; *Comment on Document MEPC 62/5/15 on the Possible Use of Revenues Generated by an Emissions Trading System*, Submitted by France, IMO Doc MEPC 62/5/35 (20 May 2011). Given their similarity, the proposals of France, Norway and the United Kingdom have been consistently lumped together when considered and assessed by the committee.

³⁹⁴ MEPC 60/4/54, *supra* note 385; *Possible Uses of Revenues Generated by an Emissions Trading System*, Submitted by Germany, IMO Doc MEPC 62/5/15 (6 May 2011); *Design and Implementation of a Worldwide Maritime Emission Trading Scheme: Results of a Scientific Study*, Submitted by Germany, IMO Doc MEPC 63/5/9 (23 December 2011); *Design and Implementation of a Worldwide Maritime Emission Trading Scheme: Full Report*, Submitted by Germany, IMO Doc MEPC 63/INF.14 (23 December 2011).

The ETS has received a great deal of attention and enjoys formal support from a substantial number of member states, all of which are European. A relatively successful land-based ETS is in effect in Europe, which has covered all flights between member states since 2012, without any discrimination based on nationality.³⁹⁵ In the shipping context, an ETS would impose a global cap on emissions and create an international marketplace in which emissions credits would be auctioned off. Unlike the SECT proposal, which also involves a credit trading system, the global ETS could incorporate credits from other sectors, such as CDM credits, to allow shipowners to better offset their emissions. Norway proposed a limited exemption clause for voyages to developing countries, while France supported small, controlled side auctions to help facilitate the participation of smaller shipowners. The carbon cap would be certain (although perhaps not easy to set), but the price of emissions may not be predictable. This might deter investors and create unwanted uncertainty in the shipping sector and could interfere with operational planning for shipowners. Finally, in comparison to the GHG Fund, the ETS would be very costly and difficult to administer and regulate. The potential for fraud and abuse would need to be addressed.

Expressed Trade Law Concerns with MBMs

During MEPC 62 deliberations with respect to MBMs, the delegation of India raised the question of possible incompatibility between proposed shipping MBMs then under discussion and WTO rules.³⁹⁶ While noting that other delegations were of the view that the proposed MBMs were compatible, India felt that such a conclusion was premature, given that the proposals lacked sufficient detail to enable such determination. Instead, India proposed that the compatibility of MBM proposals with international trade rules should be examined before the MEPC decided on the adoption of any such measures.³⁹⁷ Several

points of contention were enumerated,³⁹⁸ centring on the GATS³⁹⁹ and GATT 1994.⁴⁰⁰ India reiterated its concerns at MEPC 63, but this time also questioning the validity of the mandatory EEDI adopted under MARPOL Annex VI in the face of the guiding UNFCCC principle of CBDR.⁴⁰¹ In response, the committee began by recalling the remarks of a WTO representative at GHG-WG 3 to the effect that the WTO could not challenge a global agreement facilitated by the IMO and that the WTO rules should not be invoked as a mechanism for stalling progress on climate change action. Because of the contingent of delegations that remained concerned about a possible WTO conflict, however, the committee agreed to continue the debate at MEPC 64, inviting further submissions.⁴⁰²

A second document was put forward by India at MEPC 64, this time with Saudi Arabia as co-sponsor.⁴⁰³ The two member states reiterated that, in their view, it was premature for the IMO to conclude that all proposed MBMs were theoretically implementable, in part because “most of the MBM proposals lack sufficient details and are not mature enough to lend support to any such conclusion,” and also because none had been satisfactorily assessed vis-à-vis WTO rules.⁴⁰⁴ The two delegations addressed four key principles of the WTO rules that they felt had been threatened by one or all of the proposed MBMs.

First, the concept of MFN treatment, set out in both GATT and GATS, was identified as a potential problem, although it was admitted that negotiations on maritime transport services under GATS were still ongoing, and thus operation of GATS in this area had been suspended unless members had specifically opted for inclusion.⁴⁰⁵ In the WTO context, MFN treatment is designed to counter discrimination (both de jure and de facto) by ensuring that all like products

³⁹⁵ David B Hunter & Nuno Lacasta, “Lessons Learned from the European Union’s Climate Policy” (2009) 27 *Wis Int LJ* 575 at 583, 585–89. See also Christian de Perthuis & Raphael Trotignon, “Governance of CO₂ Markets: Lessons from the EU ETS” (2014) 75 *Energy Pol’y* 100; Beat Hintermann, “Market Power in Emission Permit Markets: Theory and Evidence from the EU ETS” (2017) 66 *Envtl & Resource Econ* 89.

³⁹⁶ *Possible Incompatibility between WTO Rules and a Market-based Measure for International Shipping*, Submitted by India, IMO Doc MEPC 62/5/27 (20 May 2011) [MEPC 62/5/27].

³⁹⁷ *Ibid* at 3; MEPC 62 Report, *supra* note 315, annex 8 at 2.

³⁹⁸ MEPC 62/5/27, *supra* note 396 at 2.

³⁹⁹ GATS, *supra* note 117.

⁴⁰⁰ GATT 1994, *supra* note 115.

⁴⁰¹ MEPC 65/3/8, *supra* note 318; *Report of MEPC on its 63rd Session*, IMO Doc MEPC 63/23/Add.1 (14 March 2012), annex 14 at 2–4, annex 17 at 1–4.

⁴⁰² MEPC 63 Report, *supra* note 316 at 43.

⁴⁰³ *Possible Incompatibility between the WTO rules and Market-based Measures for International Shipping*, Submitted by India and Saudi Arabia, IMO Doc MEPC 64/5/3 (29 June 2012) [MEPC 64/5/3].

⁴⁰⁴ *Ibid* at 1.

⁴⁰⁵ *Ibid* at 2.

(or services in the case of GATS) are treated equally regardless of their nation of origin.⁴⁰⁶

Another feature of GATT 1994 addressed by the two delegations was article V, which applies the MFN principle to freedom of transit of goods and vessels.⁴⁰⁷ While none of the proposed MBMs would affect transit of goods per se, the Indian and Saudi delegations cited this provision to emphasize “that the MFN treatment obligation applies to all ships and vessels with regard to their entry, exit or departure at ports irrespective of the origin or the flag.”⁴⁰⁸

Any MBM providing for port state detention of foreign ships (namely, the GHG Fund and the ETS), argued India and Saudi Arabia, would amount to product discrimination and thus a violation of the MFN principle. Of course, this interpretation requires that ships be viewed as “products” under GATT 1994.⁴⁰⁹ Another cited MBM that might run afoul of the MFN principle was the Jamaican Port State Levy proposal. The reasons here are difficult to follow, but the crux of the reasoning seems to be that “levying a uniform emissions charge on all vessels, on a non-discriminatory basis, would be administratively cumbersome.”⁴¹⁰

The two delegations also addressed a broader issue arising from the MFN principle: the expected increase in freight costs resulting from the adoption of any MBM. Such an increase would disproportionately affect the competitiveness of exports from the developing world, given that developing economies export a substantial share of freight with a low value-to-weight ratio. This would result in destabilization of the world markets and could lead to “like products being treated in an unlike fashion,” which is prohibited under WTO rules, subject to certain exceptions. Finally, under any MBM, benefits would be conferred upon any nation able to modernize its shipping fleet. Since fleets from developing countries are less likely to be modernized, this would also result in discriminatory treatment under the MFN principle.⁴¹¹

406 *Ibid.* The two delegations pointed to the framing MFN provisions in both GATT 1994 and GATS: GATT 1994, *supra* note 115, art I.1; GATS, *supra* note 117, art II.1.

407 GATT 1994, *supra* note 115, art V.2.

408 MEPC 64/5/3, *supra* note 403 at 3.

409 *Ibid* at 4–5.

410 *Ibid* at 6.

411 *Ibid* at 5.

Second, the national treatment obligation prohibiting discrimination of imported goods in favour of domestic ones, enshrined in article III of GATT 1994,⁴¹² was addressed.⁴¹³ Invoking unnamed WTO Appellate Body holdings, the two delegations took the position that such provisions are generally afforded a broad interpretation, applying to a broad range of discriminatory measures. As in article I, both *de jure* and *de facto* discrimination are covered.⁴¹⁴

In addition to an alleged MFN conflict, it was argued that any MBM allowing for the detention of non-complying foreign vessels might also run afoul of the national treatment obligation because it would have the potential effect of disadvantaging imports in favour of domestic goods.⁴¹⁵ Similarly, with regard to the Port State Levy proposal, given that domestic goods would not be subject to a levy of any kind, and given the broad interpretation afforded to article III of GATT 1994, a levy on foreign shipping emissions imposed by port states, India and Saudi Arabia have argued, might be seen as undue discrimination favouring domestic goods.⁴¹⁶

Third, the two delegations pointed to WTO provisions respecting fees and charges on imports and exports.⁴¹⁷ Such provisions allow member states to impose fees and charges, but restrain their amounts to the “approximate cost of services rendered” and explicitly prohibit indirect protectionism or taxation of imports for fiscal purposes.⁴¹⁸ Given that the Jamaican Port State Levy would exact a levy on incoming foreign shipping while failing to render any tangible service, the Indian and Saudi delegations argued that this MBM amounts to a taxation of imports for fiscal purposes, and thus constitutes a violation of GATT 1994, article VIII.⁴¹⁹

Fourth, India and Saudi Arabia raised the general elimination of quantitative restrictions on imports and exports as a potential issue.⁴²⁰ The relevant provisions in GATT 1994 cover

412 GATT 1994, *supra* note 115, arts III.2, III.4. See also GATS, *supra* note 117, art XVII, which extends similar protections to service sectors included in each WTO member’s individual schedule.

413 MEPC 64/5/3, *supra* note 403 at 3.

414 *Ibid* at 2–3.

415 *Ibid* at 5.

416 *Ibid* at 6.

417 *Ibid* at 4.

418 GATT 1994, *supra* note 115, arts II.2(c), VIII.1(a).

419 MEPC 64/5/3, *supra* note 403 at 6.

420 *Ibid* at 4.

any quantitative prohibition or restriction “made effective through quotas, import or export licenses or other measures.”⁴²¹ Any MBM giving port states the power to exclude non-complying vessels, they argued, could be taken to be in breach of the quantitative provisions of WTO rules, given that the goods carried aboard excluded vessels would be effectively prohibited from importation. Furthermore, the two delegations argued that the requirement for a vessel to carry proof of compliance with any MBM could be taken as a requirement to carry a sort of import licence, which would violate the afore-mentioned provision in GATT 1994.⁴²²

One final MBM characteristic worth noting is a financial penalty imposed on a ship’s operator as a result of non-compliance. With specific reference to the UK version of the ETS proposal, India and Saudi Arabia argued that “[L]evying a penalty on the ship’s operator is...equivalent to levying a penalty on the goods carried.”⁴²³ Such an interpretation would allow for an argument to be advanced that the imposition of penalties violates each of the four enumerated WTO principles.

The Indian and Saudi delegations concluded by arguing that “shipping is a servant of world trade,” and that “the industry should not and must not introduce measures which would create complications for world trade and trigger trade disputes.” Because the participation of the developing world in international trade is essential to the continued generation of wealth in those nations, and because a continued generation of wealth is required if those nations are to take measures to combat global warming, the adoption of any MBM in the shipping sector would only prove counterproductive and exclusionary.⁴²⁴

At MEPC 64, the committee again decided to defer consideration of the potential WTO issue to the following session, at which point an impact assessment of the various MBMs would be available.⁴²⁵ At MEPC 65, the secretary-general produced a document outlining the views of the WTO Secretariat on the previous session’s

submission by India and Saudi Arabia.⁴²⁶ While the interpretation of WTO rules falls within the exclusive purview of WTO members, rather than that of its secretariat, it was noted that the document submitted to the MEPC was of a neutral character and meant to “flag out what could be some of the main [WTO] disciplines to which IMO member states would need to be alerted.”⁴²⁷ However, the WTO document stopped short of providing substantive guidance and assistance to further deliberations on MBMs. Perhaps, in light of the observation with respect to the likely difficult relationship between the international trade and climate regimes noted earlier in this report, it can be reasonably expected that the above issues, and perhaps others, may again arise in the event of further consideration of an MBM for international shipping in the IMO strategy.

The above discussion again underscores the value of coordination of the climate change regime and WTO rules with respect to GHG emissions. The ideal scenario for an MBM in the future revised IMO strategy — the one least likely to generate conflict with the WTO regimes — is one in which the measure is the product of consensus, adopted within the framework of an international maritime convention, or an alternative instrument.

421 GATT 1994, *supra* note 115, art XI.1.

422 MEPC 64/5/3, *supra* note 403 at 6.

423 *Ibid* at 7.

424 *Ibid*.

425 MEPC 64 Report, *supra* note 322 at 38.

426 *World Trade Organization’s Views on Document MEPC 64/5/4 Submitted by India and Saudi Arabia*, Note by the Secretary-General, IMO Doc MEPC 65/INF.18 (21 February 2013). See especially the attached annex, containing a copy of the letter from the WTO Secretariat.

427 *Ibid* at 2.



POSSIBLE LESSONS FROM OTHER SECTORS

International Civil Aviation Sector

Not unlike other key contributors to global GHG emissions, the aviation industry, which according to ICAO was responsible for roughly two percent of global CO₂ emissions in 2010 and various non-CO₂ climate effects,⁴²⁸ has its own unique challenges. The two percent figure requires explanation. International aviation accounts for 1.3 percent of actual emissions. The bulk of emissions from aircraft are released at cruising altitude and their effects are thereby amplified. Taking this effect into account, it has been estimated that aviation generally may actually be responsible for as much as 3.5 percent of global anthropogenic radiative forcing, a more precise measure of climactic effects.⁴²⁹ Furthermore, the steady and rapid expansion of the industry, coupled with the difficulties of introducing technological and operational measures in aircraft to significantly increase operating efficiency, have created unique challenges for the sector to reduce emissions in the short to medium term. In other words, growth in volume in the international aviation sector will make it difficult for efficiency measures to stabilize and reduce GHG emissions in the foreseeable future, let alone achieve full decarbonization of the sector in the long term.⁴³⁰ The industry has therefore taken a very modest approach to reducing its CO₂ footprint by supporting an out-of-sector approach of carbon offsetting, which enables industry operators to purchase credits from the global carbon market.

In 2010, ICAO adopted two aspirational goals. First, the industry committed to a two percent annual improvement in fuel efficiency for commercial aircraft on international flights. This was to be achieved via operational and technological measures. According to a report issued in 2015, however, the industry is lagging seriously behind with

⁴²⁸ ICAO *Environmental Report 2010* (Montreal: ICAO, 2010) at 38, online: ICAO <www.icao.int/environmental-protection/Documents/EnvironmentReport-2010/ICAO_EnvReport10-Ch1_en.pdf>. A different and more recent estimate reports that international marine and aviation bunkers are together responsible for three percent of global CO₂ emissions: Key CO₂ Emissions Trends: Excerpt from CO₂ Emissions from Fuel Combustion (2016) (Paris: International Energy Agency, 2016) at 9 [IEA 2016 Report], online: <www.iea.org/publications/freepublications/publication/KeyCO2EmissionsTrends.pdf>.

⁴²⁹ *Aviation and the Global Atmosphere: Summary for Policymakers* (Geneva: IPCC, 1999) at 6–9.

⁴³⁰ See Markus Gehring & Freedom Kai-Phillips, “Intersections of the Paris Agreement and Carbon Offsetting: Legal and Functional Considerations” CIGI, Policy Brief No 88, 15 September 2016 at 6. Emissions increased by a factor of 95 percent between 1990 and 2014. The next two decades are expected to see yet another doubling of emissions in the sector.

respect to this first goal. Efficiency has improved at approximately half the targeted annual rate.⁴³¹ This is likely due in part to low fuel prices and the resulting lack of economic motivation for operators and manufacturers. The Thirty-eighth Meeting of the ICAO Assembly saw the adoption of a resolution for a “basket of measures” to facilitate the transition of the aviation sector, including aircraft technology CO₂ standards; operational measures; promotion of fuel efficiency and alternative fuels; and establishment of an MBM for emissions reductions of international aviation.⁴³²

The second goal committed the industry to offsetting emissions above 2020 levels from 2020 onwards (“carbon-neutral growth”). This differs from the approach to “carbon neutrality” in the context of Airport Carbon Accreditation, which means that “all the emissions under direct control of these airports have been offset, on top of the reductions that have been made.”⁴³³ With regard to this second goal, and in light of the challenges mentioned at the outset, it was clear that carbon offsetting was the preferred path forward. To that end, ICAO agreed, at the Thirty-ninth Meeting of the ICAO Assembly in fall 2016, to adopt an assembly resolution to set in place the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), a global MBM scheme.⁴³⁴ Despite the industry’s lacklustre performance since 2010 on the technical and operational front, ICAO has maintained its original goal of carbon-neutral growth from 2020.

As adopted, CORSIA consists of three distinct phases. This phased approach recognizes the differing capabilities of member states and seeks to minimize market distortion. A pilot phase is set to run from 2021 to 2023 and is completely voluntary. There follows the first phase (2024–2026), which is also voluntary, but will automatically include any states that participated in the pilot

phase. Finally, participation in the second phase (2027–2035) is intended to be mandatory for all states whose 2018 revenue per tonne-kilometres (RTKs) will exceed 0.5 percent of the industry total. Further, any state whose cumulative share of RTKs falls into the top 90 percent in the industry should be included.⁴³⁵ The participation of LDCs, SIDS and landlocked developing countries (LLDCs) will be entirely voluntary. ICAO plans to review CORSIA every three years from 2022 onward, thus allowing room for adjustments.

Although participation in the pilot and first phases is voluntary, the response of member states has been strong. As of August 23, 2017, 71 nations representing 87.7 percent of RTKs had opted to participate in CORSIA starting with the pilot phase.⁴³⁶ This places state participation at a level that is already very close to the level mandated for the second phase beginning in 2027 and appears to bode well for the implementation of the program. It should be noted, however, that several states have declined to sign on to the pilot phase. Argentina, Brazil, Chile, India, Russia, Saudi Arabia and Venezuela objected to CORSIA for various reasons, including their view that the measure will not further carbon-neutral growth from 2020, and that its implementation will disproportionately burden developing countries.⁴³⁷ It will be recalled that some of the developing states in this group have taken similar positions at the IMO.

CORSIA has been designed to distort the market as little as possible. To this end, ICAO has opted for a route-based approach, which should ensure that all operators on the same route are treated in the same way. Only flights between two participating CORSIA states are covered by offsetting requirements. Operators are tasked with estimating their annual CO₂ emissions (based on fuel consumption) on such routes and reporting them to their respective national authorities.

431 Anastasia Kharina & Daniel Rutherford, “Fuel Efficiency Trends for New Commercial Jet Aircraft: 1960 to 2014” (August 2015) International Council on Clean Transportation White Paper. This rate of efficiency improvement puts the industry approximately 12 years behind its first target.

432 ICAO, “Consolidated Statement of Continuing ICAO Policies and Practices related to Environmental Protection – Climate Change”, Resolution A38-18, i-68–i-77, online: ICAO <www.icao.int/environmental-protection/Documents/A38-17_A38-18.pdf>.

433 *Airport Carbon Accreditation – Annual Report 2016–17* (Airports Council International, 2017) at 4, online: <www.airportcarbonaccreditation.org/library/annual-reports.html>.

434 *Consolidated Statement of Continuing ICAO Policies and Practices related to Environmental – Global Market-based Measure (MBM) Scheme*, ICAO Resolution A39-3 (October 2016).

435 See e.g. Study for the Directorate General Climate Action of the EU Commission, *Possible Legal Arrangements to Implement a Global Market Based Measure for International Aviation Emissions* (2 December 2015), online: EC <https://ec.europa.eu/clima/sites/clima/files/transport/aviation/docs/gmbm_legal_study_en.pdf>.

436 ICAO, “Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)”, online: ICAO <www.icao.int/environmental-protection/Pages/market-based-measures.aspx>.

437 Jordan R Labkon, “ICAO Strikes Deal at 2016 Assembly to Create the First Global Market-based Mechanism for International Aviation Emissions” (20 December 2016), online: VedderPrice <www.lexology.com/library/detail.aspx?g=2cbeeb2a-dba0-44ce-bc4e-454151b08dfd>.

Every year, ICAO intends to calculate the sectoral growth factor on CORSIA, which it will multiply by each operator's applicable emissions to calculate required offsets. The use of overall sectoral growth as the key metric was considered preferable, as it is expected to be more stable than that of individual operators, whose fortunes are far more diversified. From 2030 onward, however, the emission increases of individual operators will be taken into account in calculating offsets.⁴³⁸ By 2033, each operator will be responsible for offsets on a 70/30 basis, where a minimum of 70 percent of its offset will be calculated using its own growth from 2020, and a maximum of 30 percent of the offset will be based on sectoral growth from 2020. This model is particularly beneficial to established operators, and harder on new operators and others who expect to see a rapid rate of growth in the period before 2030. It reasonably assumes that 14 years' warning is sufficient for operators that might expect growth higher than the overall industry rate after 2030.

In early 2017, ICAO announced the adoption of an additional emissions reduction measure to supplement CORSIA. This measure took the form of an amendment to Annex 16 of the Chicago Convention on International Civil Aviation.⁴³⁹ The standards vary depending on aircraft size and type, and will apply to all new aircraft as of 2020. By 2023, all in-production aircraft will be expected to conform to the standards, lest they be forced out of production by 2028.

With all this in mind, a pressing question emerges: what can the shipping sector learn from the approach taken by ICAO? It is difficult to assess the success or failure of a regulatory mechanism for international aviation that does not enter its pilot phase until 2021, making it speculative to draw lessons for the international shipping industry. At first blush there appears to be some similarity in the measures considered in the two industries. International aviation embraced a technical measure as well as an MBM, and international shipping has, to date, used technical and operational measures and may yet consider an MBM.

However, there are significant differences between the two industries, potentially limiting the utility of the experience of the international aviation industry, most notably with respect to the issues of nationality (ease of reflagging), jurisdiction and port state control. The conventional wisdom is that shipping has an advantage over aviation in that technical and operational measures are more easily adopted in the shipping sector. For example, the practice of slow steaming alone can reduce bunker consumption by up to 59 percent.⁴⁴⁰ There are obvious logistical pitfalls inherent in slow steaming practices, and the current low cost of fuel makes it far less attractive; it would also appear that commercial aviation has no operational emissions reduction option that comes close. Furthermore, shipping currently enjoys a wide variety of fuel options, many of which produce far lower GHG emissions than the traditional bunker C. Fuel switching may be more difficult to implement for aviation. Thus, operational and technical measures in the initial IMO strategy appear to be more readily available to the international shipping industry than they are to the international civil aviation industry. In consequence, the manner through which ICAO and the IMO have engaged the GHG discourse is different. ICAO has been more willing to consider exemptions for operators from LDCs, SIDS and LLDCs, which could be challenging in the implementation of the IMO strategy because reflagging is an option in international shipping. Hence, the NMFT principle in the IMO has guided discussions to date on technical, operational and market measures, and will continue to apply to measures adopted under the IMO strategy.

Given that CORSIA is years away from full implementation, it is not possible to assess its effectiveness with any certainty. Many of its critics, however, have pointed out that there is little incentive to reduce emissions in the short term, and that offsetting carbon emissions from commercial aviation is a way of externalizing costs and therefore merely a licence for operators to continue polluting.⁴⁴¹ The fear is that offsetting is an unreliable non-solution that ignores the underlying problem (i.e., the need for all sectors to substantially reduce emissions and set on a path toward decarbonization) and encourages

⁴³⁸ Individual operator growth will be integrated progressively starting at 20 percent from 2030 to 2032 and increasing to 70 percent from 2033 to 2035. *Ibid.*

⁴³⁹ *Convention on International Civil Aviation*, 7 December 1944, 15 UNTS 295 at annex 16, vol III (entered into force 14 April 1947).

⁴⁴⁰ Andreas Wiesmann, "Slow steaming: A Viable Long-term Option?" (2010) *Wärtsilä Technical J* 49 at 50.

⁴⁴¹ Jonathan Fränkel-Eidse, "Will the Aviation Sector's Planned Carbon Offset Scheme Help Curb Emissions from Air Travel?" (28 September 2016) *Earth Island J*, online: www.earthisland.org.

technological and operational stagnation while emissions continue to rise within the sector. MBM proposals in the shipping sector that rely heavily on offsets have been similarly criticized. Obviously, no matter what sector embraces an offsetting scheme, it is essential to ensure the legitimacy and carbon value equivalency of the projects receiving funding. As far as technological and operational stagnation is concerned, CORSIA could well run into difficulty, given its early focus on sectoral rather than individual growth. Not until operators begin to be assessed by their own emissions growth or reductions in 2030 will there be a genuine incentive to make individual reductions via technological or operational means. Arguably, however, the 2017 amendment to Annex 16 of the Chicago Convention mentioned above should be expected to pick up some of the slack left by the first decade of CORSIA. It is difficult to see how the emissions path expected from full implementation of the CORSIA would be in line with the goals of the Paris Agreement unless there are convincing reasons why the sectors fair share is considerably less than the global average emissions reductions needed to meet the goals of the Paris Agreement.

Domestic Transportation Sector

Domestic land-based transportation has been a particularly challenging sector for jurisdictions around the world. GHG emissions in this sector have continued to rise, while other sectors, such as the electricity sector discussed below, have been able to achieve significant emissions reductions. The domestic transportation sector has been particularly challenging for several reasons.⁴⁴²

The challenges and potential solutions for domestic transportation are quite diverse. The challenges are different for freight than for personal transportation. There are important differences between urban and rural areas. Potential solutions will be different for each of these transportation sectors and contexts. They will furthermore depend on regional differences in population density, distances between and

size of urban centres, existing infrastructure, availability of alternatives, and willingness to invest in alternatives, among other factors.⁴⁴³

Personal transportation offers a good illustration of the challenge of selecting appropriate long-term solutions for decarbonization in at least three different categories: within urban centres; between urban centres; and in rural areas. Within urban centres, public transit and active transportation offer the most sustainable alternatives to the predominance of gasoline-powered cars. Both active and public transportation, however, require significant investment of infrastructure, further technological innovation and depend on acceptance by the population.⁴⁴⁴ At the same time, a number of technologies, over the past decade or so, have offered potential solutions that might not require the same level of investment in public transit or active transportation infrastructure, and would not require the same level of behaviour change, but would also be less optimal from a sustainability perspective. They all focus on reducing emissions from private vehicles rather than shifting from private vehicles to other modes of transportation. Options pursued have ranged from ethanol and fuel cell vehicles to hybrid and electric vehicles.⁴⁴⁵

To date, there has not been a clear winner among the technologies to reduce emissions from private vehicles, with each potential alternative offering its own advantages and challenges. Ethanol vehicles would require the least change in infrastructure or behaviour, but there are serious questions about the environmental and GHG emissions implications of this option. Fuel cell vehicles would require significant new infrastructure and have been plagued with delays in the development of the technology. However, they would offer the end user a product similar to their current expectations, so would be likely to find broad acceptance.⁴⁴⁶ Hybrid vehicles are perhaps most similar to traditional gasoline vehicles, but do not

442 For an overview of perspectives on the transportation challenge, see e.g. Michael K Hidrue et al, "Willingness to Pay for Electric Vehicles and their Attributes" (2011) 33:1 Resource & Energy Econ 686; Noel Smith, Donald Hirsch & Abigail Davis, "Accessibility and Capability: The Minimum Transport Needs and Costs of Rural Households" (2012) 21:1 J Transport Geog 93; Wolfgang Gruel & Frank Piller, "A New Vision for Personal Transportation" (2016) 57:2 MIT Sloan Mgmt Rev 20.

443 See e.g. Yan Song, Yanping Chen & Xiaohong Pan, "Polycentric Spatial Structure and Travel Mode Choice: The Case of Shenzhen, China" (2012) 4:4 Regional Science Pol'y & Prac 479.

444 Maria Vittoria Corazza et al, "A European Vision for More Environmentally Friendly Buses" (2016) 45:4 Transportation Research Part D: Transport & Env't 48.

445 Commentators who do not consider the environmental consequences of these choices tend to be inclined to advocate for a mix of public, active and private transportation; see Gruel & Piller, *supra* note 442. The challenge from a GHG emissions or sustainability perspective is how to influence the path currently dominated by market forces and individual preferences.

446 Thanh Hua et al, "Status of Hydrogen Fuel Cell Electric Buses Worldwide" (2014) 269:1 J Power Sources 975 at 980.

offer a complete solution. Finally, electric vehicles hold much promise, but concerns over range, availability of charging stations and cost remain, and their sustainability depends in large part on the ability to generate electricity sustainably, which may differ from region to region.⁴⁴⁷

Partly resulting from this uncertainty within the private vehicle sector, the relationship between private vehicles and public and active transportation in urban centres also remains uncertain. Hesitancy to make infrastructure and technology investments in public and active transportation contributes to the uncertainty. Solutions will vary between jurisdictions, and will depend on further technological and economic breakthroughs, which in turn will depend on regulatory and other measures taken by national and subnational governments in the respective jurisdiction.

Personal transportation solutions between urban centres would seem to involve a choice between zero-emissions personal vehicles, rail, bus services or air transport. Electric vehicles currently face concerns over range constraints and lack of charging stations. Rail infrastructure is expensive, making it a high-risk option unless it is clearly the mode of choice and has the population density and support to warrant the investment. Bus service tends to be more compatible with existing infrastructure in many parts of the world, but faces acceptance challenges, and would still require technological advances to become truly sustainable. Air transport seems the most difficult to transition to sustainability, but is quickly becoming the mode of choice for travel between urban centres in many parts of the world.

For personal transportation in rural areas and from rural areas to urban centres, low population density and long distances create unique challenges that often eliminate the otherwise most promising options, such as active transportation, public transit and often even rail and air. This makes personal vehicles the most likely choice for personal transportation in rural areas.⁴⁴⁸

The result is a situation where there is no single mode of transportation that is the clear choice in solving the personal transportation challenge in all categories or subsectors. Which mode (or

combination of modes) offers the best hope of moving personal transportation to GHG emissions neutrality and sustainability will depend on local or regional conditions, on existing infrastructure, on personal choices and preferences of the population, and on the willingness of the public and private sector to invest in the infrastructure and R&D needed to facilitate the transition. The multitude of options and circumstances makes it less likely that private or public actors will make the investments needed to facilitate the transition.⁴⁴⁹

Questions about the role of self-driving vehicles, car-sharing and “Uber-like” services have started to raise some doubts about the future dominance of public transportation in urban centres. Until recently, it seemed clear that public and active transportation would be essential for low GHG emissions transportation in urban centres. There is no doubt both still have an important role to play, but it seems more likely, with the possible emergence of self-driving electric vehicles, that they will continue to compete with cars in many urban centres. Some cities are clearly committed to a combination of public transit and active transportation as the solution to congestion and pollution, but many others are still primarily designed for road transportation, resulting in difficult choices ahead as self-driving electric vehicles, car sharing and Uber-like services start to dominate road transportation.⁴⁵⁰

There are similar challenges with respect to sustainable transportation between urban centres. Does the answer lie in high-speed trains, or can short-distance flights become a sustainable option? Is the electric car a viable solution, with improvements in technology and more sustainable sources of electricity? Will electric buses gain the acceptance needed to become an important part of the solution?⁴⁵¹

All these questions matter because some of the most promising options require significant investment in infrastructure, in the form of charging stations for electric cars, or in the form of rail infrastructure. All require further R&D to become truly sustainable, but also critical choices about the combination of options that offer the best solutions in each context. One of the most

⁴⁴⁷ Hidrue et al, *supra* note 442.

⁴⁴⁸ Smith, Hirsch & Davis, *supra* note 442.

⁴⁴⁹ Gruel & Piller, *supra* note 442.

⁴⁵⁰ *Ibid.*

⁴⁵¹ Song, Chen & Pan, *supra* note 443.

challenging questions is when to decide on a specific path to sustainable transportation, and which path, and whether this is a decision for governments or for the private sector. Until that choice is made, there will be a tendency to continue with the status quo, which means minimal emissions reductions in the transportation sector. Until there is an investment in the infrastructure to offer viable and attractive alternatives, efforts to reduce emissions from transportation from vehicles running on combustion engines will likely only yield modest results, based on marginal changes in behaviour and improved fuel efficiency of combustion engines. Making the choice too late delays significant emissions reductions in the sector; making the choice too early, in turn, risks committing to an alternative that turns out to be suboptimal financially and environmentally. Market mechanisms alone will not be sufficient in driving the transition to alternatives that require significant infrastructure investment. What is required is either a public investment in the infrastructure necessary to make the alternative viable and attractive, or a clear and sufficient commitment to the alternative to motivate private investment.⁴⁵²

What lessons does the experience in transportation offer for the challenge of regulating GHG emissions from ships and the ultimate decarbonization of the maritime transport sector? It seems clear from the experience so far that economic incentives, such as subsidies for electric vehicles or public transit, only get you so far. Other key elements include clear signals about the mix of modes that are considered part of the solution in a particular jurisdiction, investment in infrastructure, and incentives for the investment in R&D to improve the sustainability performance of key elements of the solution. The transportation sector illustrates the need to find effective ways to encourage research, development, deployment and commercialization of technologies that offer meaningful solutions in line with what is needed. More generally, transportation may offer lessons on the effectiveness and limitations of MBMs or economic instruments more generally. The experience suggests that economic incentives are

essential, but that a detailed understanding of the sector is required to be able to assess what can and cannot be achieved with economic instruments, and what complementary measures are needed.

Efforts to deal with transportation on a voluntary basis suggest limited effectiveness of bottom-up approaches, voluntary measures or aspirational goals. For example, voluntary efforts to encourage improved fuel efficiency of vehicles have largely failed, both at the manufacturing level and at the consumer level.⁴⁵³ It is important to be realistic: unless there is a clear economic motivation to influence human behaviour, there is little reason to expect voluntary measures to work, especially when dealing with corporate actors concerned about short-term economic returns on investments. Voluntary measures can work, however, in combination with economic incentives and binding measures, if carefully designed.⁴⁵⁴

Finally, the transportation sector illustrates the challenge of regulating the transition to GHG neutrality when there are multiple possible paths, and where the number of possible paths and their relative merits may change over time. In such circumstances, governments face difficult choices. They can rely on market mechanisms to avoid having to choose among the multiple paths, but risk private actors reacting to the economic incentive by choosing a suboptimal path. The alternative is for government to choose among the possible paths, and risk making the choice too early, with government itself choosing a suboptimal path. A mix of tools, based on a detailed understanding of the current conditions in the sector, the local circumstances and processes that are able to identify and adjust to changing circumstances, appear to be key ingredients of success.

452 There has been considerable discussion in the literature on effective mechanisms to facilitate the development and deployment of technologies to achieve environmental and sustainability goals. See e.g. Miranda Schreurs, "Breaking the Impasse in the International Climate Negotiations: The Potential of Green Technologies" (2012) 48 *Energy Pol'y* 5; David Ockwell & Alexandra Mallett, eds, *Low-Carbon Technology Transfer: From Rhetoric to Reality* (London, UK & New York, NY: Routledge, 2012); Abbe EL Brown, ed, *Environmental Technologies, Intellectual Property and Climate Change* (Cheltenham, UK & Northampton, MA: Edward Elgar, 2013).

453 Martin Olszynski et al, "From Smokes to Smokestack: Lessons from Tobacco for the Future of Climate Change Liability" *Geo Envtl L Rev* (forthcoming).

454 See e.g. Daniel J Fiorino, *The New Environmental Regulation* (Cambridge, MA: MIT Press, 2006); David M Driesen, *The Economic Dynamics of Environmental Law* (Cambridge, MA: MIT Press, 2003).

Electricity Sector

In contrast to the transportation sector, the electricity sector has been among the more successful sectors in reducing GHG emissions in many jurisdictions around the world. This is in part because there are both new and well-established low-GHG sources of electricity that have made significant technological and cost breakthroughs over the past two decades, due in large part to aggressive policies in European and other countries that have spurred investment in research and commercialization.⁴⁵⁵ Wind and solar energy in particular, along with conservation and efficiency programs, have contributed to significant emissions reductions in the electricity sector in jurisdictions in Europe, Asia and North America.⁴⁵⁶

The transition has not been without its challenges, and in spite of all the progress to date, the path to full decarbonization is far from clear. The fundamental challenge is that existing electricity systems are designed to meet demand rather than to effectively manage demand to meet the supply of less dispatchable power sources; their design is also based on centralized production of electricity. Fossil fuel-based production tends to be more dispatchable than wind, solar, tidal, wave and other low-GHG sources. In developed countries, significant capital investments have already been made in fossil fuel-based production and in transmission and distribution based on centralized production. This means that even where low-GHG alternatives are competitive, a switch to alternatives may require significant infrastructure investment and may leave stranded significant assets, such as fossil fuel-based electricity generation systems.⁴⁵⁷

As is the case with transportation, there are challenges in identifying the most suitable pathway to GHG neutrality. The state of electricity infrastructure will vary from jurisdiction to jurisdiction, as does the mix of potential sources of

electricity. Population density, climate conditions and differences in electricity demand for heating, cooling and industrial use further complicate matters. The potential to store energy in a manner that is easy to access when electricity demand exceeds production from low-GHG sources is also quite variable from jurisdiction to jurisdiction.

All this adds up to a complex picture, particularly once the penetration of wind and solar threatens the ability of current electricity systems to meet electricity demand. Some jurisdictions may find an energy mix that allows them to integrate enough solar and wind to complete the transition away from fossil fuels without fundamental changes to their electricity systems. Jurisdictions with access to dispatchable hydropower may be able to phase out fossil fuels in this manner.

For most jurisdictions, attention to the energy mix will not be enough. This leaves them with three basic choices. They can invest in better interconnection with other jurisdictions to balance supply and demand. Alternatively, they can shift from a focus on meeting demand to managing demand to match the supply of electricity, using some combination of smart-grid technology and storage. Finally, they can try to implement a combination of these basic approaches to managing supply from renewable sources. As is the case with transportation, the uncertainty around the relative advantages and disadvantages of these choices has slowed down progress. For example, jurisdictions may be reluctant to invest in transmission infrastructure to improve the ability to integrate wind and solar into their electricity system over concerns that the infrastructure may become a stranded asset as smart grid and storage technologies continue to develop and drop in price. Uncertainty surrounding the respective roles of the various levels of government and private sector in deciding on the appropriate path, and investing in making it work, further adds to the complexity in many jurisdictions.⁴⁵⁸

A key lesson from electricity is that governments struggle to take measures to internalize the cost of GHG emissions from traditional sources of electricity (i.e., coal and oil) because access to electricity is considered an essential service, so that governments tend to be sensitive to increases in

⁴⁵⁵ Schreurs, *supra* note 452.

⁴⁵⁶ See e.g. Atle Midttun, "The Greening of European Electricity Industry: A Battle of Modernities" (2012) 48 *Energy Pol'y* 22; Thilo Grau, Molin Huo & Karsten Neulhoff, "Survey of Photovoltaic Industry and Policy in Germany and China" (2012) 51 *Energy Pol'y* 20; Uwe Büsgen & Wollhart Dürrschmidt, "The Expansion of Electricity Generation from Renewable Energies in Germany: A Review Based on the Renewable Energy Sources Act Progress Report 2007 and the New German Feed-in Legislation" (2009) 37:7 *Energy Pol'y* 2536.

⁴⁵⁷ Melissa Harris, Marisa Beck & Ivetta Gerasimchuk, *The End of Coal: Ontario's coal phase-out* (Winnipeg: International Institute for Sustainable Development, 2015).

⁴⁵⁸ Jamshid Aghaei & Mohammad-Iman Alizadeh, "Demand Response in Smart Electricity Grids Equipped with Renewable Energy Sources: A Review" (2013) 18 *Renewable & Sustainable Energy Rev* 64.

electricity prices. The end result is that electricity generally continues to be subsidized in various ways, making it harder for conservation, efficiency and renewable energy initiatives to compete. While there are those who would be unduly harmed by increased electricity prices, most citizens in developed countries are more likely to be able to afford higher electricity prices and would take measures to conserve electricity if the price more accurately reflected the true cost of generating and providing it. So far, the predominant response to this dilemma in developed countries has been to resist increases in electricity prices, rather than allow prices to increase to encourage conservation and efficiency and implement measures to ensure those unable to pay the increased cost of electricity are treated fairly.⁴⁵⁹

As stated at the outset, advances in technology have been critical to the progress in reducing GHG emissions in the electricity sector. Effective regulation of the sector, in turn, has been critical in ensuring the investment in R&D and in the scaling up of key technologies. Initial leadership came from Germany and other European countries.⁴⁶⁰ More recently, other countries, such as China and the United States, encouraged growth and advancements in these sectors through a combination of subsidies and regulations. Similar efforts are now under way in other key countries, such as India.⁴⁶¹ Ultimately, and looking back, the leadership of developed countries with the capacity to support the emergence of these new industries was key. Developing countries were then able to follow suit, once the price of solar and wind had come down enough to make investment feasible. The end result is the penetration of new technologies and new industries in both developed and developing countries.⁴⁶² Of course, all this has not happened without friction. There have been trade disputes over the implementation of measures to encourage

renewable energy, including WTO challenges of feed-in tariffs and local manufacturing rules in Ontario, and solar policies in India and China.⁴⁶³

Another lesson from the electricity sector is that regulatory and economic instruments, such as cap-and-trade systems, carbon taxes, feed-in tariffs and renewable portfolio standards, were significant contributors to progress, although their relative contribution can be debated. Concurrently, more directed measures were often necessary to ensure sustained progress.⁴⁶⁴ For example, the phasing out of coal, where it has happened, has not been achieved through the use of economic instruments, but rather through top-down regulation requiring the closure of coal plants.⁴⁶⁵ Similarly, investment in R&D and infrastructure has generally been necessary as a complement to economic instruments and renewable targets to sustain efforts to transition to GHG neutrality.

The experience of the electricity sector suggests that economic incentives are important instruments in the tool box, but a detailed understanding of the sector is required to be able to assess what can and cannot be achieved with economic instruments, and what other tools and efforts are needed for an effective, efficient and fair transition. For example, experience has shown that economic incentives alone are unlikely to result in the closure of existing coal plants, or in encouraging investment in expensive infrastructure.

459 See Meinhard Doelle, "Toward a Principled Design of Provincial Cap & Trade Systems: Lessons from Nova Scotia's Proposal to Meet the Carbon Pricing Requirement in the Pan-Canadian Framework for Climate Change" (2018) *J Envtl L & Prac* [forthcoming].

460 See e.g. Rainer Hinrichs-Rahlwes, *Sustainable Energy Policies for Europe: Towards 100% Renewable Energy* (Leiden: CRC Press, 2013); Allan Mazur, *Energy and Electricity in Industrial Nations: The Sociology and Technology of Energy* (London, UK & New York, NY: Routledge, 2013).

461 For an overview of progress in key developing countries over the past 20 years, see Patrick Bayer, Lindsay Dolan & Johannes Urpelainen, "Global Patterns of Renewable Energy Innovation, 1990-2009" (2013) 17:3 *Energy for Sustainable Dev* 288.

462 Zachary D Liscow & Quentin C Karpilow, "Innovation Snowballing and Climate Law" (4 May 2017) *Yale Law & Economics Research Paper No 571*, online: SSRN <ssrn.com/abstract=2927441>.

463 See e.g. Llewelyn Hughes & Jonas Meckling, "The Politics of Renewable Energy Trade: The US-China solar dispute" (2017) 105 *Energy Pol'y* 256. As the authors have suggested elsewhere in this report, ideally, IMO and WTO measures would be mutually supportive in the global effort to encourage fair trade while facilitating the full decarbonization of the global economy in line with the goals of the Paris Agreement. A more modest goal would be to avoid conflict between the response developed by the IMO and existing WTO rules discussed above.

464 David M Driesen, "Emissions Trading Versus Pollution Taxes: Playing 'Nice' With Other Instruments" (2017) *Envtl Law* [forthcoming]; Nicholas Rivers & Mark Jaccard, "Intensity-Based Climate Change Policies in Canada" (2010) 36:4 *Can Pub Pol'y* 409 at 411-13; Harris, Beck & Gerasimchuk, *supra* note 457; David Houle, *Carbon Pricing in Canadian Provinces: from Early Experiments to Adoption (1995-2014)* (PhD Thesis, University of Toronto, 2015) at 25, 33.

465 Harris, Beck & Gerasimchuk, *supra* note 457.





DETERMINATION OF THE INTERNATIONAL SHIPPING INDUSTRY'S "FAIR SHARE" AND POTENTIAL LEGAL PATHWAYS

The Challenge of Uncertainty

International maritime regulation has always had to deal with complex issues and relationships accompanied by degrees of uncertainty. The regulatory issues have tended to constitute a complex mix of commercial, technological and political drivers. The public and private actors in international marine transportation have been guided by national interests, commercial underpinnings and community concerns. Often, the issues have cut across various international regimes, not just the IMO conventions. The vital importance and dynamic nature of these factors have produced complex multi-level relationships. The IMO has acted as a funnel for these interests in its efforts to develop comprehensive and viable regimes based on regulatory compromise and solutions to problems. The IMO itself has undergone institutional evolution to enable it to equip itself and adapt to new challenges.

It is likely that the IMO has never had to consider such a long-term timeline, with such complexity and urgency, in the development of regulatory strategy for a specific issue area. The organization's experience in the long process of understanding GHG emissions from international shipping, and exploring a path to determine the industry's fair share to GHG emissions reduction, can be described as a steep learning curve. While it is true that the regulation of air and other sources of vessel-source pollution has been a labour of decades, GHG regulation constitutes a much more complex mix of dynamic factors and related uncertainties, over a much longer time frame, indeed spanning the twenty-first century. The longer the timeline, the greater the complexity of interacting variables and relationships (as discussed in this report), the likelihood of less capacity to forecast the full economic repercussions, and the consequent heightened uncertainty. As MEPC deliberations have amply demonstrated, there is genuine concern that GHG maritime regulation may produce uncertain or unexpected direct and indirect impacts, as illustrated during discussions on MBMs with respect to impacts on trade and developing countries. Maritime regulation in response to climate change can be expected to be shadowed not only by "knowns" and "known unknowns," but also by "unknown unknowns." The "knowns" have enabled the IMO to adopt important evidence-based

amendments to MARPOL Annex VI, Chapter 4. The “known unknowns” have led to the establishment of the fuel database to build understanding on fuel use and energy efficiency for further regulation. The “unknown unknowns” are off the radar screen, and demand a flexible and adaptive approach with periodic review of the IMO strategy.

Against this backdrop, the initial IMO strategy is a framework for action and the pursuit of maritime regulation will require the IMO (through its member states) to clarify commitments. It will need to position itself to be ambitious and nimble, able to manage uncertainty, learn, review and respond to or further anticipate changing variables and potentially varying outcomes. Such an exercise calls for a dynamic and complex application of the multi-disciplinary strategy that will provide directions for the organization, its membership and the international maritime community to adapt to a new energy environment — and consequently a new business environment in search of constant innovation. To do so, the organization will need to conduct its work not only by employing the traditional approach in developing technical and operational rules and standards, for which it has a well-established and largely successful record. It will need to implement an ambitious, integrated, systemic and reviewable approach to GHG regulation as a long-term learning process in the strategy, punctuated by periodic review to take stock (and be part of the global GHG stocktake within the Paris Agreement) and benefit from feedback loops by adjusting its ambitions and approach as appropriate. It will need to work within its own treaty regimes, as well as interact with other international regimes. It will need to use its experience in pursuing inclusive processes to produce largely consensus-based and ambitious mandatory rules and standards, voluntary standards and recommended practices, in concert with efforts in combating climate change under other regimes. Non-maritime regime rules may at times facilitate and at other times constrain what the IMO is able to do, hence the importance of a systemic, integrated approach to the complex global problem addressed by the strategy.

The actions needed cut across diverse economic sectors at national, regional and global levels and engage regulatory bodies at all those levels, within the respective sector and at times in relationship to other sectors and overseeing regulatory bodies. A challenge for the IMO will be to define appropriate

roles for member states and for private industry actors in achieving emissions reductions in the international shipping sector. In the process of transition, it needs to maintain a level playing field while sending a clear message to national maritime administrations and the shipping industry.

In an emissions reduction strategy that is narrowly focused on the shipping sector, it might be somewhat easier than in a global climate regime to anticipate links between commitments of states and the expected behaviour of industry actors in the shipping sector. Some of these industry actors will be public, but most will be private. While the actors responsible for meeting emissions reduction commitments will be predominantly private industry actors, changes within the shipping sector will have broader economic consequences, including consequences for the development of economically vulnerable states. The international shipping industry will need to work with the IMO in lock-step, not only because the IMO is the regulatory body, but also as a matter of corporate social responsibility and joining ranks with other non-maritime sectors in the collective response to climate change.

Toward a Vision and Timeline

The Quest for the Vision

The action required of the global community to respond to climate change is guided by the long-term temperature goal adopted in the Paris Agreement.⁴⁶⁶ The agreement commits state parties to “strive to formulate...long-term low greenhouse gas emission development strategies” and to communicate these to the Secretariat of the UNFCCC.⁴⁶⁷ The long-term vision entails a range of long-term actions, such as the technology development and transfer framework and mechanism.⁴⁶⁸

As discussed above, the initial IMO strategy was adopted with the stated vision that reflects the international shipping industry’s commitment to reducing GHG emissions and to phase them out in this century. The IMO was under pressure to develop a fair and meaningful international shipping industry contribution to the global response to

⁴⁶⁶ Paris Agreement, *supra* note 8, art 2(1).

⁴⁶⁷ *Ibid*, art 4(19).

⁴⁶⁸ “Parties share a long-term vision on the importance of fully realizing technology development and transfer in order to improve resilience to climate change and to reduce greenhouse gas emissions.” *Ibid*, art 10(1).

climate change as defined in the Paris Agreement.⁴⁶⁹ This will require substantial commitment in the implementation of the IMO strategy, not only to reducing emissions significantly in the short and medium term, even as global trade may continue to grow, but also to pursue R&D and employ technologies that will place the industry on the path to eventual complete decarbonization. At this time, the IMO strategy is pitched at a high level of generality, without targets, specific measures and related timelines. These will need further definition and specific metrics to facilitate implementation, monitoring and progress evaluation.

The Paris Agreement's approach to setting targets, the relationship between collective and individual targets, and the process for reviewing progress and ensuring compliance all offer potential guidance for the IMO as it seeks to move forward with the strategy with an effective approach to achieving adequate emissions reductions in the international shipping sector.⁴⁷⁰ At the same time, there are important differences between the UN climate regime and the IMO that have to be considered when drawing lessons from the Paris Agreement. The Paris Agreement is an agreement between states and it creates obligations for states for GHG emissions reductions across the economies of party states. The IMO strategy does not establish legal obligations and will focus on one sector, shipping, and it will target, much more directly than the Paris Agreement, the key industry actors involved in the sector. Careful thought will have to be given to the applicability of lessons from Paris in light of these key differences.

Development of the Long-term Goal

There is broad support for the proposition that the international shipping sector should make a fair contribution to the long-term goals of the Paris Agreement. Ultimately, and as described earlier, this means making a fair contribution to the following goal set out in article 2(1)(a) of the Paris Agreement: "holding the increase in the global average temperature 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."⁴⁷¹ There are a number of challenges for the IMO member states to turn the global goals in the Paris Agreement into a concrete

emissions reduction target for international shipping in the strategy, including the following.

- The IMO will have to resolve whether to use 1.5°C or some other global average temperature goal "well below 2 degrees" as the starting point for its analysis.
- Current analysis, including analysis by the IPCC, is focused on 2°C and therefore does not accurately determine the global effort needed to meet the article 2 goal. The IPCC's work on 1.5°C is scheduled to be completed in 2018.
- Other key elements of the long-term goal in the Paris Agreement, such as the goal to achieve a balance of emissions and anthropogenic removals in the second half of the century, were inevitably based on the IPCC's analysis of 2°C and will require updating once the IPCC concludes its analysis on 1.5°C.
- A determination will have to be made whether international shipping's fair contribution would be similar to the average reductions needed globally, whether there are reasons to expect the sector to reduce emissions more rapidly, or whether there are reasons to allow the sector more time to reduce emissions.
- The elements that would go into such an analysis have not been agreed upon either within the UN climate regime or the IMO, and some likely elements, such as the effort needed, the technology options available or expected to be developed, and the costs involved in the shipping sector compared to other sectors, are currently not all equally well understood, hence the generality of the initial IMO strategy. The success of states in implementing and improving their NDCs over time may also impact on what can be reasonably expected from the international shipping sector.
- There is significant uncertainty about some of the assumptions underlying the IPCC's 2°C scenario analysis, most notably with respect to the role of future negative emissions in keeping temperatures within 2°C. The same is expected to be the case with the IPCC's pending analysis for 1.5°C, as these uncertainties are not likely to be resolved for some time. This does not mean the IPCC analysis should not form the basis for setting a long-term goal for the shipping sector, but it does suggest

⁴⁶⁹ *Ibid.*, art 2(1)(a).

⁴⁷⁰ *Ibid.*, arts 2, 3, 4, 13, 14; Meinhard Doelle, "Chapter 22: Assessment of Strengths and Weaknesses" in Klein et al, *supra* note 26 at 375.

⁴⁷¹ Paris Agreement, *supra* note 8, art 2(1)(a).

that adjustments may have to be made as the IPCC refines and revises its analysis over time. In other words, the initial IMO strategy will have to be adjusted as circumstances warrant, in view of adoption of the revised strategy in 2023 and periodically thereafter.

The IMO strategy's vision would benefit from clarification of the underlying long-term goal for international shipping. A long-term goal could be based on the 2008 peak year in the strategy and the average global effort, as confirmed or clarified by the 1.5°C IPCC analysis to be completed in 2018, as a starting point for the emissions reduction efforts of the sector, and could be revised as circumstances warrant. It would be important to be clear at the outset about the factors that would warrant adjustments to the long-term goal, and the process involved. Having set the process for adjustments, the sector would then be ready to synch its initial long-term goal with the time frame identified by the IPCC within which global emissions need to equal emission removal, also referred to as the GHG neutrality date. For a 1.5°C target, the global GHG neutrality date can be expected to be some time before 2050. GHG neutrality, in the context of the Paris Agreement, means net zero emissions. The maritime sector would have to decide whether it will focus on the shipping sector in isolation (referred to above as an "in-sector focus") and turn the neutrality goal into a decarbonization goal for international shipping, or whether it wants to work collaboratively with other sectors and integrate its efforts into the global GHG neutrality goal (referred to above as an "out-of-sector focus"). Other key elements of a long-term goal for the shipping sector include the rate of reduction from peak emissions to full decarbonization or emission neutrality. These elements of the initial long-term goal could all be based on the IPCC's analysis, including in particular the 1.5°C scenario analysis expected in 2018. This does, however, raise timing challenges in light of the IMO strategy timeline.

This "approximation" or initial long-term goal for the shipping industry could then be regularly reviewed and updated as agreement is reached on the elements to be considered and as more detailed information is available on the chosen elements. Adjustments to the long-term goal could be made over time, based on clearly established factors. Such factors could include changes to the way parties to the Paris Agreement approach and define the long-term goal in article 2, changes

to the IPCC's understanding of the potential contribution of negative emissions, and actual global progress toward the Paris article 2 goal.

Development of the Approach to Meeting the Goal

Having clarified the long-term goal and a process for updating and revising it, the IMO would then be positioned to work back from the long-term goal and develop steps toward meeting that goal. There appear to be two sets of short-term goals and steps in this process: the 2018 initial strategy and agreement on the 2023 revised strategy. A suitable medium-term target is 2030 (coinciding with the end of the medium term in the strategy), perhaps depending on whether the long-term GHG neutrality goal is closer to 2040 or 2050, something that should be better understood once the IPCC releases its 1.5°C scenario analysis in October 2018.

The key elements for the initial IMO strategy and its revision and adoption by 2023 are the following.

- A commitment to a clear and fair long-term goal in the vision and a credible and transparent process for reviewing and updating it.
- Medium-term goals that offer a credible trajectory toward the long-term goal.
- A credible and transparent process for reviewing progress toward the long-term and medium-term goals, and a commitment and effective processes to implement and adjust regulated technical and operational measures necessary to meet the long-term goal. This should include commitments and effective processes to regularly review and update technical and operational measures to ensure best practices to maximize efficiency at all times.
- Specific binding measures to aggressively promote R&D and to implement and continuously improve best available technologies and operational practices to reduce emissions in the short and medium term, with an initial focus on operational measures that are ready for immediate implementation. Continuous attention to hull design, propulsion systems and zero-carbon fuels will be essential during all phases.
- Gradual ratcheting of technical and operational measures, particularly through the EEDI

and fuel measures, but also other measures supported by new technological developments.

- It is conceivable that with technological development, technical (ship design, propulsion technology, and so forth), operational and fuel measures could be sufficient in setting international shipping on the path to decarbonization. However, it is too early to dispense with the possible need of an MBM, hence its inclusion as a potential medium-term measure in the initial strategy. As concluded by the IMO's Second GHG Study,⁴⁷² a commitment to adopt an effective MBM as part of the revised strategy in 2023, with a commitment to design and implement the mechanism to achieve the long-term and medium-term goals, and review its performance periodically remains advisable.
- A process of review and adjustment of the initial and revised strategy and its implementation that is effectively synchronized with the global stocktake of the Paris Agreement, so that information about progress in this sector can feed into the five-year review cycles under articles 13-15 of the Paris Agreement.
- Confirmation of 2008 as the appropriate peak year for emissions from the sector.

The approach should recognize that efficiency gains through improved ship design and operation have multiple benefits in the short, medium and long term, especially if the regulations have a built-in mechanism for continuous improvement. In the short term, they demonstrate that the sector is taking the issue seriously, and they will be critical to meeting the short-term goals of the strategy, such as the goal of 2008 remaining the peak year for emissions from the sector. They also help make the medium- and long-term goals less daunting and less challenging from a technical perspective. The more the energy consumption of ships can be reduced, the more likely it is that solutions using alternative fuels such as electricity, hydrogen fuel cells or biofuels can contribute to the full decarbonization of the sector in the longer term. At the same time, efficiency measures alone are clearly insufficient to achieve full decarbonization within a time frame that represents a fair contribution from the sector. This means that progress in ship technology and operation should be combined with a clear strategy for achieving the technology

breakthroughs needed to fully decarbonize the sector as soon as reasonably possible. This cannot be achieved without effective measures to find suitable fuel alternatives to hydrocarbon-based bunkers, most likely through a combination of regulated standards and other incentives.

Ports also have a potential role to play, as recognized in the initial IMO strategy. In addition to performing critical spot inspections under MARPOL and regional memoranda of understanding (MoUs) to ensure compliance with international standards, ports are essential for bunkering and, assuming the necessary infrastructure is in place, are in a position to provide key services such as cold ironing (shore-to-ship power). Because they enjoy sovereignty over internal waters, port states are able to tighten emissions control requirements while the ship is in port. Effectively, they determine whether a ship may trade with their ports. However, it is advisable for port state measures to be as consistent as possible with international standards, rather than be imposed unilaterally without reference to such standards, because uniformity is important for maritime trade.

One way to conceive the overall challenge for the sector would be in three phases: an initial efficiency phase; a decarbonization phase; and a negative emissions phase. In each phase, the implementation of the strategy would focus on a combination of achieving the primary goal of the phase, and at the same time to prepare in a meaningful way for the following phase. The first phase would start with the initial strategy in 2018 and would retain the 2008 peak year for the industry and strive for further emissions reductions, hopefully coinciding with the revised strategy in 2023 or following shortly thereafter. The second phase would start with the implementation of the revised strategy in 2023, which could include an effective MBM (as now anticipated by the initial strategy), assuming it is needed to supplement technical and operational measures, designed to effectuate the decarbonization of the sector within time frames consistent with the long-term goal and with a clear understanding of the rate of reductions needed to achieve the goal. A pilot for the MBM could be implemented toward the end of the initial efficiency phase, so that the MBM is fully operational in the 2023-2030 period. Toward the end of the decarbonization phase, as the sector gets closer to meeting its decarbonization goal, the sector's role in the negative emissions phase would be clarified and facilitated.

⁴⁷² Second GHG Study, *supra* note 286.

The Role of International Maritime Regulation

Choice of Instruments

The IMO instrument of choice for the initial measures to regulate GHG emissions adopted to date has been MARPOL Annex VI. Alternative options included adoption of a new annex or separate convention, the principal advantage arguably being the ability to provide dedicated treatment to a particularly complex problem that may require more than technical and operational measures usually employed to prevent vessel-source pollution. The prolonged IMO deliberation on GHG emissions and the consideration that technical and operational measures were practical steps that could be adopted in the short term likely favoured the use of an existing instrument to the creation of a new one. The development of a convention or protocol or a new annex would have been a lengthy, multi-year process leading to adoption at a diplomatic conference. In contrast, amending an existing annex could be undertaken using the much faster tacit acceptance process. Moreover, a new annex would have had to be optional and would have necessitated years to secure broad support by a sufficient number of state parties representing the bulk of global tonnage. In comparison, although Annex VI does not command the same high level of state parties as other annexes, what really matters is that the subscription rate and tonnage represented are very high. Tacit acceptance of amendments has ushered in (and will again in the future) new standards with the usual period of a year, unless there is substantial objection to the amendment during the prescribed period for objections in accordance with MARPOL's amendment procedure.⁴⁷³

A further argument in support of Annex VI as the regulatory vehicle is the desirable unity and coherence of the pollution prevention system. Characterizing GHG emissions as vessel-source pollution facilitates coordination of the regulatory requirements of the various types of pollution from ships. There is likely to be greater consistency among technical standards, reporting expectations and enforcement across the MARPOL annexes. As seen earlier, issues of potential consistency across regulations and their purposes have arisen, as in the case of fuel requirements for

controlling NOx and GHG emissions. Thus, with respect to technical and operational measures, the use of Annex VI facilitates an integrated and systemic approach to pollution prevention.

The adoption of an MBM may raise additional questions, such as whether placement of the measure in MARPOL Annex VI, or a new annex, or indeed in MARPOL itself, would be the appropriate legal pathway. MARPOL's strength is its design as an instrument focusing on technical and operational measures with an enforcement system to match. It is appropriate to enquire whether it would be a suitable vehicle for the adoption, implementation, enforcement and periodical review of market measures. The adoption of market measures would be a novelty for the IMO, whose work to date, although punctuated by occasional political controversies, has been essentially technical. Its focus on technical aspects has generally enabled it to avoid or manage differences and achieve regulatory consensus. MBMs are economic instruments aimed at market intervention or influence. MARPOL was not designed to accommodate a framework for the collection of levies or to enable the organization to introduce market instruments. The IMO's own constitutive instrument, while clearly broad enough to permit consideration of any issue concerning international shipping and the environment, is unclear with respect to whether the organization's power includes adoption of regulations concerning a carbon levy and a related fund or establishing a carbon credit system. Its express financial powers are limited to budgetary matters and the scale of assessment of membership dues.⁴⁷⁴

Accordingly, in the event an MBM is a desirable component of the future strategy, the IMO will need to consider how its constitutive instrument will support such an initiative and what legal pathway would be the most suitable and practical for this purpose. It is useful to recall that the International Oil Pollution Compensation Fund was established by a separate treaty and has its own secretariat and separate legal personality.⁴⁷⁵

However, on such a complex issue as market measures, the option of developing a new maritime convention could be undesirable because of the

⁴⁷³ MARPOL, *supra* note 10, art 66.

⁴⁷⁴ IMO Convention, *supra* note 189, Part XII.

⁴⁷⁵ International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 18 December 1971, 1110 UNTS 57 (entered into force 16 October 1978).

predictably lengthy process of development. Much as MARPOL is essentially a technical and operational standards instrument, as a potential candidate host for an MBM in Annex VI it carries the advantage of the tacit acceptance procedure, which was designed precisely to avoid cumbersome diplomatic processes in maintaining the instrument up to date, as well as the substantial tonnage subscription already in place.

Should MARPOL not be deemed the legal pathway, another potential alternative and novel approach for an MBM for international shipping is to consider developing it in coordination with the UN climate regime and perhaps even under article 6 of the Paris Agreement. The feasibility of such an option and its significance for the IMO mandate in its constitutive instrument would need to be studied.

An additional question is whether it is desirable to endow the IMO strategy with a legal status. At this time, the initial IMO strategy is a political document carrying no legal effect. This reflects the pragmatism with which deliberations took place in the MEPC. It is conceivable that aspects of a future iteration of the strategy could be brought under MARPOL Annex VI, thus scaling up the status of the strategy. This has pros and cons. On the one hand, it could cement its authoritative status and enable its updating using the tacit acceptance procedure. On the other hand, it could add an additional layer of complexity to the already complex deliberations, and in any case the GHG regulatory measures already have a home in Annex VI. Giving the strategy (or aspects of it) a legal status might not necessarily carry much advantage. The alternative and pragmatic approach is simply to continue considering the strategy as a “policy” document, perhaps akin to the IMO’s own strategy, which is updated biennially and adopted by an assembly resolution. This approach has enabled the IMO to operationalize its mandate, set specific regulatory targets and deadlines, and update the document as a rolling plan.

Applying the IMO Regulatory Process

Over the many years of successful regulation, the IMO’s culture of consensus has dominated decisions, despite the rule on majority decision making in its constitutive instrument, enabling it to find common denominators for a wide suite of decisions and ensuring broad support. The next steps in adopting and implementing action measures of the IMO strategy and prospective GHG

regulation will test the ability of the organization to rely on consensus to achieve an outcome that reflects a fair contribution from this sector. The adoption of MARPOL Annex VI, Chapter 4, with a majority decision has now established a precedent on this issue and, given the continuing divisions on sharing of responsibilities and role of market measures, it is conceivable that further use of majority decision making is possible and perhaps necessary to achieve adequacy. The frequent concerns expressed by major developing countries, most especially Brazil, China and India, can be expected to resurface. These are points on which compromise has to be reached, in particular because they are large GHG emitters, are among the largest economies and have high GDP growth forecast.⁴⁷⁶ Out-voting major states does not bode well for what is necessarily a complex long-term regulatory process, both in terms of fostering the organization’s culture of consensus and securing the support of all member states, most especially major economies engaged in maritime trade. The global consensus reached in the Paris Agreement climate regime should provide the momentum and the substantive elements to aim for consensus in the implementation of the IMO strategy.

As seen earlier, the IMO has a well-defined, three-step, linear approach to the development of maritime regulation. The approach is motivated by compelling necessity, guided by a goal-oriented approach and employs a mix of mandatory and recommended practices. Given the long-term goal of IMO’s GHG regulatory efforts and the uncertainties that will serve as context and drivers, it will be important for the three-step approach to be complemented by a subsequent step of regular review and adjustment to complete the cycle so that GHG regulation will be seen as cyclical and iterative rather than linear.

It will be recalled that the IMO Council has considered a proposal from a group of member states and industry bodies to further structure and tighten the three-step approach, in particular

⁴⁷⁶ Among the largest GHG emitters in 2013, their rankings were: China (first), India (fourth) and Brazil (seventh). Johannes Friedrich, Mengpin Ge & Andrew Pickens, “This Interactive Chart Explains World’s Top 10 Emitters, and How They’ve Changed” (11 April 2017) World Resources Institute, online: WRI <www.wri.org>. In 2016, the GDP ranking was: China (second), India (seventh) and Brazil (ninth). “Gross Domestic Product 2016” (17 April 2017), World Development Indicators database, World Bank, online: World Bank <www.worldbank.org>. The GDP forecast in 2017 is as follows (no numbers were presented for Brazil): India (7.2 percent) and China (6.5 percent). Alex Gray, “These Are the World’s Fastest-growing Economies in 2017” (9 June 2017) World Economic Forum, online: WEF <www.weforum.org>.

to address data gathering, consideration of the necessity of a proposed new initiative, use of cost-effectiveness and impact analysis for short- and long-term benefits, availability of suitable technologies, transparency and robustness of procedures, consideration of impacts on manufacturers, criteria for assessing, surveying and testing technologies, implementation dates based on achievable timelines and consolidated technology, and risk-based evaluation of potential costs and benefits of environmental, economic and social issues. This proposal could enhance the process of future GHG regulation by building on the learning needed to produce functional and effective rules and standards. It entails a higher level of structured scrutiny of regulatory proposals than is the practice currently.

Experience shows that the regulatory process in the IMO is not always purely technical and on occasion has been politicized, for example with respect to the development of guidelines and decisions on the designation of particularly sensitive sea areas⁴⁷⁷ and, within the context of this report, the divisive debate on the application of the CBDR and NMFT principles in GHG regulation. Arguably, a better structured rule-making process would help minimize the degree of issue politicization by ensuring an in-depth technical assessment at each stage of the rule-making process. It is also possible that the proposed tightened process could make it more challenging to adopt measures to combat GHG emissions when the science does not provide sufficient clarity, or the technology on which the measures are based is not yet on the market, or the long-term impacts of the proposed regulatory outcome are not altogether clear. The proposed process could potentially constrain adoption of a precautionary approach to regulation in the context of scientific and technological uncertainty,⁴⁷⁸ unless flexibility is maintained.

While the IMO's GHG regulation to date has been largely top-down, the goal-oriented approach provides a measure of flexibility to enhance compliance. Annex VI's Chapter 4 rules and

standards have been legislated for implementation and enforcement by state parties with respect to ships registered under their flags. Energy efficiency goals provide flexibility for shipowners and operators to meet the standards through various means. Goal-oriented regulation has served the IMO well, especially with respect to areas where a diversity of technologies exists or further technological development is expected, such as in ship design, propulsion machinery, energy use monitoring and fuel technologies. There is also a role for bottom-up standard development, as the pioneering of new technologies and practices in industry could potentially serve as the basis for new GHG rules and standards or for scaling up existing ones. The use of industry practices or standards developed by industry associations is not unprecedented.⁴⁷⁹

Applying the Principles of Maritime Regulation

The difficult MEPC discussions identified several issues concerning the principles and practice of maritime regulation that will need resolution or adaptation if the international maritime community (both IMO member states and the shipping industry) is to produce a meaningful and realistic long-term collective response. The NMFT principle has played a key role in the development of all international maritime regulation and has played no small role in building the IMO's profile as a successful regulatory body. This principle has helped to raise the standards of shipping around the globe and is foundational not only to the international maritime conventions and their subsidiary instruments, but is also central to the operation of the global system of memoranda on port state control. These regional arrangements are increasingly coordinating practices and sharing data on inspected ships to ensure compliance with safety and environmental standards and further discourage deviance through flag hopping.⁴⁸⁰ Watering down the application of the NMFT principle will be counter-productive in maritime regulation because of the unique characteristics of the mobility of ships.

The accommodation of the special needs of developing countries as set out in the initial

477 Julian Roberts et al., "The Western European PSSA Proposal: A 'Politically Sensitive Sea Area'" (2005) 29:5 *Marine Pol'y* 431.

478 In prescribing the precautionary approach to environment protection, principle 15 of the Rio Declaration states that where "there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation." *Rio Declaration on Environment and Development*, 14 June 1992, UN Doc A/CONF.151/26 (vol I) (12 August 1992), 31 ILM 874 [Rio Declaration].

479 See e.g. *Requirements Concerning Polar Class*, *supra* note 207.

480 IMO, Press Briefing, "Port State Control Regimes Move to Boost Collaboration, Harmonization and Information Sharing" (6 November 2017), online: IMO <www.imo.org/en/MediaCentre/PressBriefings/Pages/30-PSC-workshop.aspx>.

IMO strategy will need to be addressed in ways that do not undermine the essence of maritime regulation. The CBDR principle emerged as an important equity principle in international environmental law with respect to the performance of environmental obligations by states, and not with respect to individual industry actors as is the case in international shipping. The legitimate CBDR concerns of developing countries need to be addressed in meaningful ways that do not create winners and losers within the international shipping sector.

The principles for drafting maritime regulations will play an important role in GHG regulation. There is no question that effective GHG regulation is necessary. What could be a potential issue, because of the long-term technological uncertainty, is the degree of reliance on the evidence-based approach. GHG regulatory work will need to be undertaken in the context of varying degrees of scientific and technological uncertainties and will call for the employment of a flexible, yet precautionary approach.⁴⁸¹ The principles of maritime regulation, and in particular the first principle of compelling necessity based on scientific evidence, may have to be reconciled with the reality of the scientific and technological uncertainties inherent in GHG regulation. The precedent has now been set for new GHG technical and operational standards to be integrated into MARPOL Annex VI, Chapter 4. The location of MBM regulation has options, as mentioned above. New GHG regulation will need to be consistent with existing regulation and avoid conflicting prescriptions or rules that produce conflicting outcomes. Consistency can be facilitated through an integrated approach to new regulatory initiatives and assessment of direct and indirect regulatory impacts. The pursuit of proportionality and fitness for purpose will be challenging, again because of scientific and technological uncertainties. A pragmatic and functional approach will be necessary. Periodic regulatory reviews (for example, timed with the global stocktake and parallel five-year reviews within the IMO, proposed in this report) will be helpful in ascertaining effectiveness of specific rules and standards in producing the desired outcomes. While clearly important for maritime GHG regulation, in particular because of the need to

accommodate technological change, the trepidation to adopt standards that will stand the test of the long term would be significantly alleviated by the proposed periodical reviews. Finally, clarity in GHG regulation will be vital, especially given the concerns within the industry on how to adapt to a changing regulatory and economic paradigm.

The nine principles for GHG regulation adopted by the MEPC 57 (discussed above) provide further guidance as well as additional challenges. In general, they represent a logical extension of the three-step decision-making process and six principles of general maritime regulation, while further addressing the challenges of GHG regulation. Logically, principle 1 proposes that the regulation should be effective in reducing emissions, which, after all, is the purpose of the entire IMO effort. Further, principles concerning the goal-oriented approach (6), support for technology innovation and R&D (7), and accommodation of leading technologies in energy efficiency (8) strongly buttress the necessary technical means and outcomes to achieve emissions reductions for the short, medium and long term. Similarly, the principles of cost effectiveness (3) and minimization of competitive market distortions (4) are aimed at ensuring the economic viability of the proposed regulations. Principle 5 proposes a sustainable approach to environmental regulation without penalizing trade; again, a desirable goal. In a similar spirit, principle 9 ensures the adoption of regulation which is practical, transparent and easy to administer.

Principle 2 is a reason why this portfolio of guiding concepts was not adopted by consensus. The principle restates the NMFT application to all flag states, which, as seen earlier, is central to the international maritime law conventions. The wording of the text is unfortunate, and perhaps served to fuel dissent. The actual MARPOL wording is that the convention applies to “(a) ships entitled to fly the flag of a Party to the Convention; and (b) ships not entitled to fly the flag of a Party but which operate under the authority of a Party.”⁴⁸² Through consistent text (“[W]ith respect to the ships of non-Parties to the Convention, Parties shall apply the requirements of the present Convention as may be necessary to ensure that no more favourable treatment is given to such ships”⁴⁸³), the

⁴⁸¹ *Rio Declaration*, *supra* note 478, principle 15. It may be worth exploring a possible role for the IPCC to offer a scientific basis for the regulatory work of the IMO on GHG emissions.

⁴⁸² MARPOL, *supra* note 10, art 3.

⁴⁸³ *Ibid*, art 5(4).

application and enforcement emphasis is on ships rather than state parties. This approach is similar to other maritime conventions. The purpose is to give direct application of a particular rule to all ships engaged in international shipping, no matter where they are flagged or reflagged. This principle will be critical for the effectiveness of GHG regulations in international shipping. Of course, adherence to this principle does not suggest that vulnerable states who are particularly exposed to negative economic consequences of GHG regulatory efforts should not receive assistance. In other words, the NMFT principle is of vital importance to ensure a level playing field for all ships as private commercial actors. On the other hand, the CBDR-RCNC principle addresses the needs of particularly vulnerable states, rather than the commercial actors.

Extent and Reach of GHG Technical and Operational Regulation

For the shipping industry to maximize the effectiveness of its fair contribution, it will be important that GHG regulations apply to as much of the world's fleet as is reasonably possible, and for domestic regulation to cover ships exempted from those regulations. At this time, the IMO's regulation of GHG emissions from ships in MARPOL Annex VI does not address all ships and those that are covered are subject to a transition period.

The new Chapter 4 concerning the EEDI and SEEMP rules applies to ships of 400 GT or more.⁴⁸⁴ This rule immediately eliminates many small vessels, such as numerous fishing and recreational vessels, although a national maritime administration retains the discretion to adopt measures to ensure compliance by vessels less than 400 GT with emission-control requirements of Annex VI requirements.⁴⁸⁵ In 2012, the number of fishing vessels was estimated at 4.72 million, 57 percent of which were engine-operated.⁴⁸⁶ Fishing vessels use energy intensively and are an obvious and significant source of GHG emissions.⁴⁸⁷ Moreover, the IMO's regulatory focus in MARPOL and other conventions is on ships engaged in international voyages. This limitation excludes vessels engaged in cabotage, unless a specific rule is extended

to those ships or is expressly extended to apply to domestic shipping by a state party. Annex VI, Chapter 4, applies the exemption to domestic shipping, but also stipulates that state parties "should ensure, by the adoption of appropriate measures, that such ships are constructed and act in a manner consistent with Chapter 4, so far as is reasonable and practicable."⁴⁸⁸ Hence, a lower-level duty ("should ensure," compared to the peremptory "shall") applies to promote consistency in cabotage to the extent possible.

Also excluded from application are offshore platforms, regardless of their propulsion.⁴⁸⁹ Like cabotage and most fishing and recreational vessels, offshore platforms once stationary at the operation site, are not engaged in international voyage and rather are subject to the jurisdiction of the licensing state. The offshore service vessels supporting them are deemed to be on cabotage. Hence, because the excluded vessels will tend to operate within the territorial or resource-related jurisdiction of a state party, in practice they will be expected to be captured by the NDCs under the Paris Agreement.⁴⁹⁰

In addition to these exclusions, a state party may waive compliance with the attained and required EEDI for ships of 400 GT and above.⁴⁹¹ Only existing ships may be granted the waiver, and all other vessels are subject to the full EEDI rules as of January 1, 2017.⁴⁹² The intention was to provide state parties with some flexibility to waive the requirements in an exceptional manner, when appropriate. When a waiver is granted or withdrawn, the flag state is required to report the action to the IMO for the information of the general membership.⁴⁹³

Also of note is the exclusion of vessels with a tonnage of 5,000 GT or less from reporting

⁴⁸⁴ *Ibid*, annex VI, c 4, reg 19.1.

⁴⁸⁵ *Ibid*, annex VI, c 2, reg 5.2, c 4, reg 19(2).

⁴⁸⁶ FAO, *The State of World Fisheries and Aquaculture, 2014* (Rome: FAO, 2014) at 32–33.

⁴⁸⁷ See James F Muir, *Fuel and Energy Use in the Fisheries Sector: Approaches, Inventories and Strategic Implications* (Rome: FAO, 2015).

⁴⁸⁸ MARPOL, *supra* note 10, annex VI, c 4, reg 19.2.1.

⁴⁸⁹ *Ibid*, annex VI, c 4, reg 19.2.2.

⁴⁹⁰ Many of these excluded sectors are covered under the NDCs under the Paris Agreement. As a result, states should be motivated to extend the application of these rules to their domestic shipping sector and thus encourage as much consistency and effort at emissions reductions across these subcategories of the shipping industry. The IMO can potentially play a very constructive role in this process by encouraging the application of best available technologies and operational measures across the shipping sector, including subcategories regulated domestically.

⁴⁹¹ MARPOL, *supra* note 10, annex VI, c 4, reg 19.4.

⁴⁹² The EEDI applies to vessels whose building contracts were placed on or after January 1, 2017, or whose keels were laid on or after that date, or with a July 1, 2019 delivery date, or in case of a major conversion of a new or existing ship, on or after January 1, 2017. *Ibid*, annex VI, c 4, reg 19.5.

⁴⁹³ *Ibid*, annex VI, c 4, reg 19.6.

fuel consumption to populate the IMO Ship Fuel Oil Consumption Database as of March 1, 2018.⁴⁹⁴ While, as noted earlier, the adoption of this tonnage threshold was motivated by expedience and the fact that it captures 85 percent of shipping responsible for GHG emissions, the reporting omits a substantial amount of small commercial shipping, in addition to the smaller vessels not captured by Annex VI.

Regulatory Fairness and Consistency

Accompanying the reach of IMO regulation is the challenge of achieving regulatory fairness and consistency with respect to the wide range of vessels engaged in international shipping and the diversity of trades and functions they perform, while minimizing waivers, especially with respect to operational measures. As discussed, some ships have unique build and operational requirements that demand high energy use, and this reality has already led to early amendment of Annex VI, Chapter 4, to exclude the application of EEDI to polar-class vessels. This could be a potential long-term concern, as the fleet of polar-class vessels grows in response to reduced summer sea ice in the Arctic and the concomitant increase in transit and destination shipping. Other types of ships use energy differently and navigate long distances without physical constraints such as ice presence and the need for ice-breaking, although when encountering bad weather, energy consumption will tend to increase for all ships. Yet other vessels carry refrigerated or other temperature-controlled cargo, which entails additional energy consumption, while passenger vessels require the additional energy to support hotel operations on board.

These examples highlight the importance for the different approaches in the required EEDI to account for the needs of different classes of ships.⁴⁹⁵ The prescribed rules and standards for ships will inevitably entail a mix of common and differentiated rules. The future GHG regulation of shipping will need to continue to distinguish between different classes of ships to ensure that while they meet increasingly stringent efficiency requirements, they are able to function safely and are fit for purpose.

⁴⁹⁴ *Ibid*, annex VI, c 4, reg 22A.1.

⁴⁹⁵ *Ibid*, annex VI, c 4, reg 21.

A more technically complex issue of consistency is how to introduce measures meant to help prevent GHG emissions without undermining or contradicting rules intended to address other types of vessel-source pollution, as in the case of GHG measures that could conflict with air pollution measures. Hence the earlier observation in this report that adopting an integrated approach and regulating GHG emissions in the same convention facilitates coordination to achieve the desired regulatory impact.

Another interesting angle on the invocation of the CBDR principle in GHG regulation in shipping raises an issue of potential lack of consistency and fairness. The various types of vessel-source pollution addressed by the MARPOL annexes are all subject to the same NMFT principle. The Annex VI rules concern NO_x, SO_x, particulate matter (PM) and ozone-depleting substances, some of which are related to GHG emissions. The position advanced by some states — that the distribution of the responsibility for GHG emissions from shipping ought to be made subject to the CBDR principle — is inconsistent with the general and proven approach to the prevention of vessel-source pollution, including atmospheric pollution. As observed elsewhere in this report, the CBDR principle, while critical for the effectiveness and fairness of the IMO strategy, needs to be approached in a manner that does not limit the scope of application and effectiveness of technical, operational and other future rules for ships depending on the socio-economic status of a state. The implementation of CBDR-RCNC needs to target assistance to vulnerable states more directly, while preserving the principle of NMFT for industry actors, irrespective of flag.

The Potential Role of Market Measures

Should the IMO proceed with this measure in the medium term of the revised strategy, the design of a suitable MBM will be a complex task that will require consideration of many technical, economic and political factors. There are, however, some fundamental considerations in the design of the MBM that can help shape the details of the instrument. One is the choice of the tool. The initial IMO strategy is silent on this matter. The MEPC discussions to date have considered a range of possible MBMs, including a carbon

levy, a cap-and-trade system, and variations of both, among others. Another consideration is the need for clarity around the goals of the MBM. The latter informs the former and is connected to the previous discussion about the long-term goal for the sector, so is considered first here.

The fundamental issue with respect to the goals of the MBM is whether it is primarily intended to internalize the costs of the international shipping sector using up part of the remaining global carbon budget, or primarily to incentivize private actors involved in this industry sector to facilitate the transition of the sector toward decarbonization by creating economic incentives for such actions. As mentioned earlier in this report, the MEPC discussion on MBMs has progressed to grouping MBMs as either in-sector or out-of-sector reductions, potentially indicating a choice. This choice may depend, in part, on whether the decarbonization of the international shipping sector will be technically and economically more feasible than the decarbonization of other sectors, such as electricity generation, land-based transportation, agriculture, manufacturing and the built environment. This question may be difficult to answer at this time, and that may attract different answers as efforts to decarbonize various sectors evolve over time. For example, as technological breakthroughs are achieved in various sectors, they may become more economically attractive options for decarbonization than they were before. The choice between internalizing the cost versus decarbonizing the sector as the primary goal of the MBM also depends on which approach is more likely to achieve the level of support within the IMO to ensure effective global implementation. Clarity on the goals can ensure that the discussion about the choice of instruments and the measure's detailed design is a principled one, and that there is transparency and accountability in the design of the MBM.

By way of example of issues for consideration with respect to choice of an MBM, and assuming for the purposes of this discussion that there is a choice between a carbon levy and a cap-and-trade system, there are key design elements that are common to these instruments, such as the actors captured, the activities captured and the use of any revenues generated. The relative importance of revenue generation and the selection of actors and activities targeted

will vary with choice of instrument and detailed design, in light of the overall goals of the MBM.

A carbon levy would most likely involve the collection of fees attached either to specific fuels or directly to emissions and usually would involve a fixed price that treats all units equally, although some differentiation is possible. A primary benefit of a carbon levy is that the carbon price is controlled and predictable, offering certainty to investors considering investments in emissions reduction solutions and allowing for careful management of the economic impact of the MBM on the entire sector and on individual actors within the sector and beyond. An effective carbon levy would generate substantial, predictable revenues, so decisions would have to be made on how to effectively use the revenues generated to further the goals of the MBM and to address legitimate equity concerns. The initial levy should be set to an amount to influence energy use, but will likely need to be adjusted over time to meet its stated goals. The levy would thus be phased in and adjusted over time.

Options on the allocation of revenues include using revenues to address specified inequities associated with the implementation of the carbon levy, to further incentivize research, development and dissemination of technologies seen as critical for the decarbonization of the sector, and potentially to support decarbonization outside the international shipping sector (such as through the purchase of credible offsets). At MEPC 63, the GHG-WG 3 identified a number of potential uses for MBM revenues.⁴⁹⁶ At MEPC 61, it was reported that the High-level Advisory Group of the United Nations Secretary-General on Climate Change Financing identified international shipping and aviation as potential financial sources to aid mitigation efforts and adaptation in developing countries.⁴⁹⁷ The contemplated sources included an emissions trading scheme, a fuel levy and an aviation ticket tax. More recently, the UN Secretary-General's

⁴⁹⁶ See e.g. *MEPC 63 Report*, *supra* note 316 at 42:

1. incentivizing shipping to achieve improved energy efficiency;
2. offsetting – purchase of approved emission reduction credits;
3. providing a rebate to developing countries;
4. financing adaptation and mitigation activities in developing countries;
5. financing improvement of maritime transport infrastructure in developing countries (e.g., Africa);
6. supporting R&D to improve energy efficiency of international shipping; and
7. supporting the Organization's Integrated Technical Co-operation Programme.

⁴⁹⁷ *High-level Advisory Group of the United Nations Secretary-General on Climate Change Financing*, Note by the Secretariat, IMO Doc MEPC 61/5/18/Rev.1 (13 August 2010).

High-Level Advisory Group on Sustainable Transport recommended increasing international development funding and climate funding for sustainable transport.⁴⁹⁸ The more MBM revenues are used to support decarbonization efforts outside the international shipping sector, the more compelling the case for considering the alternative instrument, a cap-and-trade system, and linking it with other existing cap-and-trade systems.

A cap-and-trade system is perhaps the most obvious alternative to a carbon levy. A cap-and-trade system for international shipping could involve setting limits for the GHG emissions from the international shipping sector as a whole, allocation of portions of the overall limit to individual industry actors or subsectors within the sector (either through auctioning, sale of allowances at a fixed price or through free allocations), combined with the right of captured actors to trade allocations with other captured actors.⁴⁹⁹ The most obvious candidates for captured actors would be fuel suppliers and vessel operators. With respect to fuel suppliers, it would need to be determined whether they would be captured by the international shipping industry's commitment or by NDCs. The choice among free allocation, sale, or auction of credits depends largely on the need to generate revenues to deal either with equity considerations, to achieve emissions reductions elsewhere, or to incentivize R&D into decarbonization technologies. Free allocation tends to reduce the short-term economic impact of the MBM, but limit options to achieve emissions reductions, deal with inequities and incentivize the decarbonization of the industry. Allocation at a fixed price mirrors the carbon levy in the sense that it permits the generation of revenues while carefully controlling the economic impact of the MBM.

A cap-and-trade system could be implemented for the international shipping sector only (in-sector, as considered above), or it could be linked to other sectors (through offsetting protocols) or to existing cap-and-trade systems (out-of-sector, as considered above). In principle, the cap-and-trade

system should be better able to directly control the emissions reductions achieved through the setting of the cap for the international shipping industry sector. However, in practice, this very much depends on the detailed design, as linking and offsetting tend to lessen control over the emissions reductions achieved and other design features, such as price floors and ceilings. Free or fixed price allocations tend to control the economic impact of the MBM on the sector. Furthermore, a carbon levy can be adjusted over time to control the emissions reductions achieved by changing the amount of the levy. With cap and trade, similar outcomes can be achieved by adjusting the cap. In short, the differences, in terms of the ability to control emissions reductions and economic impact, are more nuanced than they appear at first glance. However, carbon levies tend to be more transparent about the trade-offs inherent in their design.

If there is a clear preference within the IMO to do everything possible to achieve the full decarbonization of the international shipping sector and for this purpose adopt the simplest approach, a carbon levy would likely be the MBM of choice. The levy itself would provide an incentive for a wide range of actors in the industry, including R&D institutions, naval architects, shipbuilders, shipowners, charterers, ship managers, ship financiers, cargo owners, and so forth, to support efforts to reduce emissions. The nature and extent of the incentive would depend on the nature of the levy (applied to volume of fuel, a percentage of the cost of the fuel, or to each tonne of emission), the amount of the levy and clarity on the long-term trajectory of the levy, among other factors.

If there is a clear preference for letting market forces decide whether it is more cost-effective to reduce emissions within the sector or support reductions elsewhere, a cap-and-trade system is more likely to be the MBM of choice. It is important to recall, however, that the choice between a carbon levy and a cap-and-trade system ultimately is not as obvious as it may appear on the surface. Many of the differences that may appear fundamental are blurred in the detailed design. Ultimately, either can be designed to effectively incentivize the decarbonization of the international shipping sector; either can be designed to address identified inequities; and either can be designed to minimize the economic impact on the sector. Badly designed, either can be ineffective at reducing emissions. More important than the choice between carbon

⁴⁹⁸ *Mobilizing for Development: Analysis and Policy Recommendations from the United Nations Secretary-General's High-level Advisory Group on Sustainable Transport* (New York, NY: United Nations, 2016) at 8, online: <<https://sustainabledevelopment.un.org/content/documents/2375Mobilizing%20Sustainable%20Transport.pdf>>.

⁴⁹⁹ Of course, there are alternatives to the focus on GHG emissions, such as the cap-and-trade proposals put forward in the MEPC process for improved vessel energy efficiency.

levy and cap-and-trade system, therefore, is the detailed design, and clarity and transparency with respect to the relative priority allocated to encouraging low-cost emissions reductions, protecting the industry, protecting vulnerable states from negative economic impacts, and ensuring the decarbonization of the sector.

In theory and assuming political will, legitimate concerns about the economic impact of the decarbonization of the sector on the economies of vulnerable states can be appropriately addressed with either a cap-and-trade system or a carbon levy. The main function of either MBM can include the generation of revenues to address inequities. In the case of the carbon levy, the generation of revenues is a central feature of the MBM, so that the main issue will be the allocation of revenues to specified and demonstrated inequities. In the case of a cap-and-trade system, the key will be to avoid free allocation of allowances to ensure sufficient revenues are generated to address any specified and demonstrated inequities. In either case, while the generation of revenues occurs on the basis of the NMFT principle among industry actors, the use of revenues generated from the MBM allows for their equitable utilization in addressing the needs of developing countries adversely affected by the measures adopted.

Equity and Fair Sharing of Responsibility

The nuanced Paris Agreement approach to differentiation in the form of CBDR-RCNC and accommodation of the principle in the initial IMO strategy offer hope that the past controversy within the IMO on the respective roles of CBDR and NMFT has been largely resolved. It is important to recall that the concept of CBDR has evolved significantly under the UN climate regime. It started in the form of CBDR-RC with a focus on responsibility and capacity, and remained in this form from the inception of the UNFCCC until the Paris Agreement in 2015. In this form, it served as an important principle for developing countries to push for leadership from developed countries on a range of issues, from mitigation to adaptation and finance.⁵⁰⁰

⁵⁰⁰Jane Bulmer, Meinhard Doelle & Daniel Klein, "Chapter 3: Negotiating History of the Paris Agreement" in Klein et al, *supra* note 26 at 62.

For a long time, CBDR-RC served to preserve the binary view of states as either developed or developing. All this changed in the Paris Agreement, resolving a decade-long impasse in the climate negotiations. First, the agreement alters the CBDR-RC principle by adding the concept of national circumstances to signal that state parties differ in a range of relevant respects, not just with respect to capacity and responsibility for climate change. As importantly, the Paris Agreement puts this revised version of the principle into practice with a very nuanced and practical approach to differentiation.⁵⁰¹ The Paris Agreement applies a variety of approaches to differentiation, depending on the issue and circumstances. For monitoring, reporting, review and compliance, for example, differentiation is minimal, and largely tied to capacity, encouraging state parties seeking to avoid differentiation to invest in capacity building to support other parties struggling to meet monitoring and reporting requirements.⁵⁰²

Differentiation with respect to the substantive emissions reduction commitments of parties to the Paris Agreement is largely based on self-differentiation, but with some direction to narrow the potential scope of differentiation. For example, there is some explicit differentiation between developed and developing states with respect to economy-wide emissions reduction limits, but this differentiation is expected to diminish over time as developing countries are expected to take on economy-wide targets. This is done in full recognition that states have different levels of capacity and responsibility, and that a range of national circumstances will affect states' abilities to contribute to the global effort. There is no explicit differentiation, in the Paris Agreement, of private actors, although the impact of national efforts may, of course, affect private actors differently.⁵⁰³

The main lesson from Paris in this regard is that the answer to the longstanding disagreement about differentiation in the IMO's approach to GHG emissions reductions may be found in a nuanced and pragmatic approach to harmonizing the application of the CBDR and NMFT principles. The IMO approach that levels the playing field in the treatment of industry actors can potentially be accompanied by measures to protect vulnerable

⁵⁰¹Lavanya Rajamani & Emmanuel Guérin, "Chapter 4: Central Concepts in the Paris Agreement and How They Evolved" in Klein et al, *supra* note 26 at 81.

⁵⁰²*Paris Agreement*, *supra* note 8, arts 13, 15; Dagnet & Levin, *supra* note 51; Dagnet & Northrop, *supra* note 59.

⁵⁰³*Paris Agreement*, *supra* note 8, art 4; Winkler, *supra* note 43.

developing countries from negative economic consequences of efforts to decarbonize the shipping sector. The IMO's technical cooperation program and the Global Maritime Energy Efficiency Partnerships (GloMEEP) offer capacity building on technical and operational measures. The potential impact of a carbon levy can be mitigated by channelling the accrued monies to assist developing countries inordinately affected by the levy and enable them to gradually transition to decarbonized transportation services for their maritime trade. Other ideas for mitigating the impact for a cap-and-trade system have also been suggested (for example, IUCN, WWF). Such a multi-layered approach is consistent with the spirit of the Paris Agreement, and a pragmatic way to avoid unfairness within the shipping sector while being sensitive to the economies of vulnerable countries. A key element of the solution will be to make decisions based on evidence of impacts, rather than based on uncertainty or fear.⁵⁰⁴

The regulation of shipping has relied heavily on technology, both as a driver and as its promoter. Indeed, the availability of technology is one of the principles of maritime regulation. The promotional dimension has not always produced immediate satisfactory outcomes, as the BWM Convention demonstrates,⁵⁰⁵ but it has laid the groundwork for the forcing of technological development. A flexible, systemic approach to dealing with uncertainty should pay particular attention to enhancing the environment for R&D by “stretching goals” and through catalytic measures (already proposed by industry actors) to enhance the design, powering and operation of all classes of ships.⁵⁰⁶ Arguably, new technologies and know-how are likely to provide a greater measure of control over intended regulatory outcomes and better manage particular uncertainties.

Enhancing the environment for technological development raises a related difficult issue in terms of access to technological breakthroughs. On the one hand, open or fair access could significantly accelerate dissemination of new technological

solutions in the shipping industry and among regulators, while on the other hand, intellectual property rights and the global competition in the industry are factors that may militate against such initiatives. However, there is concern that marine technology developers may “have limited means available to prevent unauthorized use of certain types of inventions” and “this situation may reduce the value of ‘maritime’ patents, leading to less incentives to innovate and publish information on new developments.”⁵⁰⁷ Efforts at levelling the playing field in technology development and transfer have long bedevilled international relations. The LOSC attempted to address this sensitive matter by developing a regime for technology co-development and transfer in Part XIV.⁵⁰⁸ States “shall cooperate in accordance with their capabilities to promote actively the development and transfer of marine science and marine technology on fair and reasonable terms and conditions,” either directly or through a competent international organization such as the IMO.⁵⁰⁹ The technology mechanism, initially established under the Copenhagen Accord and affirmed in article 10 of the Paris Agreement, is dealing with these issues in the broader context of climate technologies. It may offer avenues for cooperation and coordination that would be valuable for the IMO to explore.

The LOSC technology cooperation duty includes “the protection and preservation of the marine environment...and other activities in the marine environment,” thus including emissions from ships, and “with a view to accelerating the social and economic development of the developing States.”⁵¹⁰ Clearly, the duty is not to transfer technology, but rather to cooperate in promoting its development and transfer. States have a further “best endeavours” duty “to foster favourable economic and legal conditions for the transfer of marine technology for the benefit of all parties concerned on an equitable basis.”⁵¹¹ The rights of technology developers are further protected by a due regard duty toward “all legitimate interests including, *inter alia*, the rights and duties of holders, suppliers and recipients of marine technology.”⁵¹² Other provisions in the LOSC set out

504 Shi, *supra* note 15 at 81

505 Paul Thomas, “Ballast water treatment, uncertainty and what to learn from it all” (16 November 2017) Fairplay, online: Fairplay <https://fairplay.ihs.com/safety-regulation/ballast-water-treatment-uncertainty-and-what-to-learn-from-it-all_20160705.html>. Rear Admiral Paul Thomas is assistant commandant for prevention policy, US Coast Guard.

506 “Regulation can provide the critical forcing function that drives innovation and encourages technological developments to meet the environmental challenges. This occurs when regulations set ‘stretch’ goals and incentivise investment to meet those goals. Regulations that embrace the status quo and codify existing commercially-available technology only serve to stifle innovation and prevent industry from meeting environmental challenges.” *Ibid.*

507 Rikard Mikalsen, Philipp Harlfinger & Anthony P Roskilly, “Patent Protection in the Marine Industry: International Legal Framework and Strategic Options” (2012) 225:3 Proceedings of the Institution of Mechanical Engineers Part M: J Engineering for Maritime Env't 232.

508 LOSC, *supra* note 9, Part XIV.

509 *Ibid.*, art 266.1.

510 *Ibid.*, art 266.2.

511 *Ibid.*, art 266.3.

512 *Ibid.*, art 267.

structures and processes for this type of cooperation, including the establishment of national and regional centres and duties for international organizations, such as the IMO, to “take all appropriate measures to ensure, either directly or in close cooperation among themselves, the effective discharge of their functions and responsibilities” with respect to the convention’s provisions in this regime.⁵¹³

From an IMO perspective, this duty buttresses the technical assistance mandate in its constitutive instrument⁵¹⁴ and provides fiat to the work of the organization’s Ad Hoc Expert Working Group on Facilitation of Transfer of Technology for Ships. MARPOL Annex VI now includes a specific provision promoting technical cooperation and technology transfer concerning improving the energy efficiency of ships.⁵¹⁵ In a similar spirit to LOSC Part XIV and article 10 of the Paris Agreement, state parties have a duty to promote and provide support, and to cooperate in the promotion of development and transfer of technology and exchange of information to states that request technical assistance. The caveat that states perform this duty subject to their own laws enables them to protect the rights of intellectual property holders.

Should an MBM be adopted by the IMO as a medium-term measure of the revised strategy, it will be important to provide the resources needed to help make future technological developments subject to open access. For example, if a levy were to be instituted, some of the funding could be directed toward R&D for the public domain.

Review, Monitoring and Compliance

Another interesting question for the IMO is whether the five-year review cycles contemplated under the Paris Agreement could have potential application to international shipping.⁵¹⁶ Whatever the goals and their legal status, there is clearly value in a process of regular reviews of progress in the IMO strategy’s key areas, such as overall emissions reductions achieved in the shipping sector, progress in R&D on long-term solutions, commercialization of key new technologies, efforts to retrofit the existing fleet, reductions from

improvement in new vessel design, reductions from operational measures, and so forth. A regular exercise of gathering the latest information on progress, in combination with the necessary analysis to determine progress against stated goals and pathways, would allow for regular adjustments to the overall approach that would offer more certainty that collective goals for the sector will be met. The performance of individual actors — both industry actors and states — would also be an important element of an effective review cycle.

Careful thought would have to be given to what information should be gathered, who would provide the information, what analysis is required, who would carry out the analysis, and what decisions are expected to be made based on the outcome of the review. Important questions include: Under what circumstances would the collective goal or the expectations of individual state or industry actors be adjusted? How should the review be linked to regulatory adjustments? What would be the consequences for individual actors of not living up to their commitments or obligations? Consistent methodologies supported by the IMO and the UNFCCC would greatly facilitate this level of cooperation and mutual support.

The recently adopted IMO Instruments Implementation Code (III Code), effective as of 2016, is important for enhancing the implementation of air pollution and GHG regulations.⁵¹⁷ Its significance lies in the introduction of a mandatory audit scheme for flag states, as well as port and coastal states. MARPOL is one of the international conventions that has been amended to provide a legal basis for the conduct of mandatory audits.⁵¹⁸ The IMO has a dedicated sub-committee (III Sub-committee) that assesses, monitors and reviews implementation of IMO conventions using port state control (PSC) reports and other data. While it spotlights issues that a member state may need to address, it also serves to inform the IMO committees regarding the need for new mandatory or voluntary measures. This arrangement is supported by the IMO’s Integrated Technical Cooperation Programme aimed at building capacity to facilitate compliance with the maritime conventions and can be expected to potentially play a key role in capacity building in furtherance of GHG emissions reduction

513 *Ibid*, art 278.

514 *IMO Convention*, *supra* note 189, arts 1(a), 2(e), 11, 15(k), 42–46.

515 *MARPOL*, *supra* note 10, annex VI, c 4, reg 23.

516 *Paris Agreement*, *supra* note 8, art 14; Friedrich, *supra* note 39.

517 *IMO Instruments Implementation Code (III Code)*, Resolution A.1070(28), 4 December 2013 (Agenda item 10), IMO Doc A 28/Res.1070 (10 December 2013).

518 IMO, “IMO Member State Audit Scheme” (2017), online: IMO <www.imo.org>.

goals.⁵¹⁹ A potential concern with mandatory audits under the III Code is the confidential nature of the audit process, effectively enabling member states to shield their record on regulatory compliance.⁵²⁰ This could be a concern in monitoring compliance with measures to reduce GHG emissions and, accordingly, it will be important for the implementation of the IMO strategy to address this potential issue. Australia, supported by several member states, recently launched an initiative in the IMO Council to review the governance of the organization and council has placed the item on its agenda.⁵²¹ This initiative could have far-reaching implications for the implementation of the IMO strategy.

At the company level, there are other instruments that could be strengthened to encourage vessel operations to minimize GHG emissions, such as the International Management Code for the Safe Operation of Ships and for Pollution Prevention (ISM Code).⁵²² Operating under the International Convention on the Safety of Life at Sea (SOLAS), the ISM Code is aimed at the promotion of safety culture in international shipping and includes an international standard for pollution prevention, as well as for maritime safety. However, at this time, and apart from generic statements concerning prevention of pollution of the environment, the ISM Code and its implementation guidelines do not contain express provisions specific to air pollution, let alone energy use and operations to reduce GHG emissions, although it is conceivable to interpret appropriate measures in this regard as implicit.⁵²³ This is an appropriate instrument to include express terms to promote a “GHG-reduction culture” in international shipping.

At the ship level, as in the case of other MARPOL regulations, the Annex VI air pollution regulations are subject to the convention’s port state inspection regime and regional MoU system described earlier. In 2018, the Paris MoU, which is the oldest PSC regional arrangement and possibly the most active, will launch

a Concerted Inspection Campaign for Annex VI and will provide insights into levels of compliance with the annex.⁵²⁴ In 2016, inspectors found 41,857 deficiencies, 3,769 of which were detainable, amounting to 3.83 percent of all inspected ships.⁵²⁵ These deficiencies were serious enough that the vessels concerned were detained in port until the deficiencies were rectified. In the same year, 428 ships had Annex VI deficiencies.⁵²⁶ These reports are potentially important for a vessel’s insurance cover. Deficiencies with respect to emissions could affect a vessel’s seaworthiness.⁵²⁷ In addition to the implications for port state inspection, the vessel’s insurance contract invariably includes express and implied seaworthiness warranties, as well as warranties of legality (i.e., the assured undertakes to operate the insured subject-matter in compliance with legal requirements).⁵²⁸

Finally, compliance could be further strengthened by providing incentives for additional industry initiatives that take early pioneering steps to retrofit the existing fleet to enhance low-carbon operations, to the extent this is technologically and economically possible, or pioneer new technologies that promise neutral or zero emissions, such as electrical propulsion and wind energy.

Inter-regime Consistency and Complementarity

Consistency and complementarity between international regimes is an important consideration in any global response to a planetary challenge such as climate change. The LOSC anticipates a complementary relationship with other conventions. The LOSC does “not alter the rights and obligations of States Parties which arise from other agreements compatible with this Convention and which do not affect the enjoyment by other States Parties of their rights or the performance of their obligations under this Convention.”⁵²⁹ More specifically on the protection and preservation of the marine environment, article 237 states that the provisions

519 IMO, “Technical Cooperation” (2017), online: IMO <www.imo.org>.

520 Transparency International recently published a report arguing for reform in IMO governance and identified the III Code as an issue. *Governance at the International Maritime Organisation: The Case for Reform* (Transparency International, 2018) at 2, online: Transparency International <www.transparency.org/whatwedo/publication/governance_international_maritime_organisation>.

521 “IMO Agrees to Explore Reforms”, *Lloyds’ List* (3 July 2018).

522 *International Management Code for the Safe Operation of Ships and for Pollution Prevention: International Safety Management (ISM) Code*, Resolution A.741(18), Adopted on 4 November 1993, IMO Doc Res A 18/Res.741 (17 November 1993).

523 A company should establish procedures, plans and instructions for key shipboard operations concerning the environment. *Ibid*, reg 7. Under this regulation, a company could include slow steaming as an operational measure to reduce GHG emissions on a voyage.

524 Paris Memorandum of Understanding on Port State Control, 2016 Annual Report at 10, online: Paris MoU <www.parimou.org/>.

525 *Ibid* at 23–24.

526 *Ibid* at 48.

527 For instance, this is the position taken by the IMO with respect to sulphur emissions. See “Ships ‘Unseaworthy’ if they Don’t Meet Emissions Rules – IM” (16 November 2017) Marine Link, online: Marine Link <www.marinelink.com/news/unseaworthy-emissions431318>.

528 On warranties, see Baris Soyer, *Warranties in Marine Insurance*, 3rd ed (London, UK & New York, NY: Routledge, 2016).

529 LOSC, *supra* note 9, art 311(2).

on marine environment protection “are without prejudice to the specific obligations assumed by States under special conventions and agreements concluded previously which relate to the protection and preservation of the marine environment and to agreements which may be concluded in furtherance of the general principles set forth in this Convention.”⁵³⁰

For example, MARPOL, as a specialized instrument on vessel-source pollution adopted *prior* to the LOSC, and the Paris Agreement, as an instrument that expands on the LOSC provisions on atmospheric emissions adopted *after* the LOSC, are captured by this provision. The article continues that specific obligations under special conventions on the marine environment “should be carried out in a manner consistent with the general principles and objectives” of the LOSC.⁵³¹ One practical consequence of this provision is that the obligations of states to mitigate climate change impacts ought to be pursued consistently with the principles of the LOSC.

Although pursued primarily by the MEPC and within the framework of MARPOL, the IMO’s current and prospective regulation of GHG emissions from international shipping interacts with other international regimes. The IMO’s constitutive instrument equips it to coordinate with other agreements and international organizations as needed, and the organization has entered into cooperation agreements.⁵³² The actual or potential interactions are frequently complementary and facilitative of IMO work. Examples of facilitative interactions are the LOSC provisions with respect to global and regional protection and preservation of the marine environment, atmospheric emissions from ships, technology transfer and the role of the IMO. In particular, the LOSC establishes a duty for state parties to prevent and enforce atmospheric pollution from ships and promotes technology transfer, as does the UN climate regime. These provisions provide context for the IMO’s efforts in developing the GHG strategy.

In other instances, the tasks assigned to the IMO require active efforts at ensuring consistency and coordination with other regimes. At the level of overall goals, it is important for the IMO strategy to be consistent with the overall goal and

governance processes of the Paris Agreement, such as increasing levels of ambition, transparency in reporting, five-year review cycle for the shipping industry’s reported contribution aligned with the global stocktake, and so on. The IPCC report on 1.5°C expected in October 2018, and the Talanoa Dialogue, will provide further opportunities for the IMO strategy to align with the climate regime.

Consistency between international regimes is also important at the level of operating principles and processes. Division in and protraction of the GHG debate in the IMO was, in part, due to the interpretation and weight given to the NMFT in MARPOL and CBDR in the climate regime, even though the approach to CBDR in the Paris Agreement evolved from a list-based approach (as in the Kyoto Protocol) to a more nuanced approach. As observed earlier, a consensus-based harmonized interpretation and application of the two principles is possible and could assist harmonization between international legal regimes without weakening either regime. Similarly, the perceptions that have been expressed and concerns raised by some delegations about potential conflict of MBMs with the WTO regime will need to be better understood so that the development of a future market instrument, if feasible and desirable, will be undertaken with a view to ensuring complementarity, thus reassuring all IMO member states. The special needs of developing countries could thus be addressed by using the structures and processes available in the regimes concerned, including the LOSC provisions facilitating cooperation in technology co-development and transfer, the IMO’s technical cooperation program and revenues from a future MBM, the climate regime structures and provisions in WTO agreements designed to assist developing countries.

A potential interaction between the IMO and United Nations Conference on Trade and Development (UNCTAD) may arise in the event MBMs are adopted under the revised strategy. The monitoring of MBM consequences for international shipping could involve the efforts of UNCTAD in its annual reporting on international shipping and seaborne trade. If UNCTAD’s mandate is engaged in this respect, it would provide a valuable information service for IMO member states.

530 *Ibid.*, art 237(1).

531 *Ibid.*, art 237(2).

532 *IMO Convention*, *supra* note 189, art 25. An example of a cooperative agreement is the Memorandum of Understanding on Cooperation between the World Customs Organization (WCO) and the International Maritime Organization (IMO) (23 July 2002), online: WCO <www.wcoomd.org/en/about-us/partners/~media/887D44574CB0487582155BDE5E42388E.ashx>.

If serious inter-regime issues of inconsistency or conflict remain unresolved, there is a danger that some IMO member states that are important for the IMO collective effort at GHG reduction may object to future amendments to MARPOL Annex VI. The IMO's policy and practice in developing the various conventions and subsequently in facilitating their implementation has been to ensure consistency with the LOSC.⁵³³ This experience indicates that the IMO is conscious of and well prepared to ensure inter-regime consistency.

Multilateralism and IMO Leadership

Finally, the IMO strategy to respond to climate change presents both opportunities and risks for the organization and the maritime community it serves. On the one hand, the adoption of credible and effective action measures under the strategy will significantly fortify faith in the organization's competence and effectiveness as an international leader and global regulator. It is further conceivable that its mandate, which to date has largely focused on the regulation of international shipping from technical and operational safety, environmental and security perspectives, including accompanying private and public law regimes, could evolve to include the regulation of market measures. If the latter occurs, GHG regulation potentially promises to be a major milestone in the organization's institutional evolution. On the other hand, if it fails to populate the strategy with action measures that represent a fair and acceptable contribution to the global response to climate change, there is the danger that the organization's credibility as an effective regulator could suffer. It is imperative that the organization develop a defensible, principled approach to the implementation of its strategy to respond to climate change.

As mentioned earlier, some NGOs expressed their frustration with the slow process by suggesting that the UNFCCC or the European Union be called upon to take appropriate action. If this occurred, it would be preferable to avoid a confrontational

approach and to always stress support for the IMO as the leading global regulator and to continue to seek effective regulation of the GHG emissions from a global industry. Moreover, in addition to the fundamental duty of good faith in the LOSC, the legal reality under the LOSC and the IMO Convention is that the IMO is the competent international organization in the convention. The European Union and IMO have, at times, had convergent views with respect to accelerating maritime regulation, as was the case with phasing out of single hulls, and usually, despite the tension, matters were resolved with the European Union supporting global regulation of shipping and the IMO's lead role in that regard. Even when the United States launched the Oil Pollution Act of 1990, it stressed its support for the IMO as the leading global regulator and has tended to participate in its work in a manner to reinforce that position. Accordingly, the major maritime nations have, despite periodic hiccups, supported the key role of the IMO, even if they are not parties to all its instruments. The hope is that pressure and leadership from outside the IMO will assist the IMO in its efforts to develop and implement an effective strategy that is well integrated globally, regionally and nationally, and that ensures a fair contribution from international shipping to the goals of the Paris Agreement.

⁵³³ The IMO Secretariat participated actively in the Third United Nations Conference on the Law of the Sea from its inception in 1973 until the adoption of the LOSC in 1982. Its contributions ensured avoidance of overlaps, inconsistencies and incompatibilities between the LOSC and the IMO conventions. This practice continued with newer conventions through the inclusion of a provision that interpretation should be without prejudice to the codification and development of the law of the sea. See e.g. *MARPOL*, *supra* note 10, art 9(2); *Implications of the United Nations Convention on the Law of the Sea for the International Maritime Organization*, Study by the Secretariat of the IMO, IMO Doc LEG/MISC.7 (19 January 2012) at 11.



CONCLUSION

In investigating the international law and policy challenges to the determination of the international shipping industry's contribution to climate change mitigation efforts through the IMO, the authors offer concluding observations on general, policy and legal considerations that have a bearing on the current and possible future directions of the nascent IMO strategy and its legal pathways. These concluding comments offer high-level observations on the issues that are addressed in much more detail throughout this report and in particular in the previous section.

General Considerations for the IMO Strategy

As will have become apparent in this report, the development of the international shipping industry's fair share of GHG emissions reductions through the IMO is an urgent matter. It is not a simple regulatory matter that can be exclusively addressed through maritime technical and operational rules and standards. The task is characterized by urgency, complexity and uncertainty: urgency because the current global response to climate change may be significantly underestimating the process of change and that decarbonization likely will have to occur at a much faster pace; complexity because of the global and transnational nature of the industry, ship technology and operations, and financing structures; uncertainty because the reduction of GHG emissions must necessarily be a long-term process spread across the rest of the century and with highly dynamic climatic, technological and economic variables.

This calls for an implementation of the IMO strategy that is integrated: systemic in scope, flexible in approach and adaptive in application. Systemic in the sense of employing traditional mandatory IMO regulatory tools, supported with voluntary measures as appropriate, while also considering new mechanisms that could be created or that are already available under other international regimes. The Paris Agreement includes elements that offer important opportunities for collaboration among the regimes (for example, articles 6, 10 and 13-15). The approach will need to be flexible in the sense that the strategy is not considered a static structure, but

rather a dynamic process whose objectives and measures will be periodically reviewed to respond to the long-term learning curve. It will need to be adaptive in the sense that, and in consequence to flexibility, the strategy must not be rigid, but should rather be considered a “rolling strategy” and regularly ratcheting up ambitions to match newer understandings of the climate change challenge, future technological possibilities and achieving effective long-term outcomes.

While it may be tempting to consider the measures and progress achieved in the collective response to climate change by other regimes and sectors as potential models for international shipping, the reality is that shipping is unique because of its context, diversity and complex drivers. While the experiences of others may inform, it is unreasonable to expect transposition of solutions from one sector to another. Each sector has its own characteristics and what really matters is not replication of any class of measures, but rather that each sector is ambitious and bears its fair share of the collective responsibility, within the context, culture, principles and processes of the industry concerned.

While progress has been achieved on GHG issues in the IMO, a major concern in the discourse to date has been the frequent lack of consensus or expression of reservations. While the organization’s majority decision-making rule ensures resolution of major controversies, this procedure tends to leave winners and losers in its wake. One of the IMO’s traditional strengths is its culture of consensus, which, while not always present in all forms of decision making and has its own concerns (for example, producing the lowest common denominator), it helps to guide the discharge of the organization’s functions and secures a high degree of support and respect for its work and its regulatory outcomes. Some of the most difficult substantive and procedural decisions in the GHG discourse to date have been taken by a majority vote. The strategy was adopted with some states expressing reservations. Given that the strategy and its future action measures for GHG emissions will become a long-term blueprint for IMO mitigation efforts, adopting them by a vote rather than backing them by consensus may not bode well for the long-term commitments needed from member states to make the industry’s mitigation efforts effective.

Policy Considerations for the Strategy

Now that the initial IMO strategy has been adopted, it is important that the collective effort in the organization not fall short so that leadership of the issue is retained. The IMO has primary competency over the sector, and the global nature and complexity of the sector clearly warrants a global approach. It also seems that there are significant benefits of a cooperative approach between the IMO and the UN climate regime. There is much to be said for a synchronized approach of state efforts in the IMO and under the Paris Agreement, in particular with regard to the vision of the IMO strategy, the level of ambition, guiding principles, timelines, as well as review of and adjustments to the strategy over time.

An essential element of a synchronized approach to the issue between the IMO and the UN climate regime is a common vision. The IMO strategy clearly articulates its intention to ensure the international shipping sector makes a fair contribution to the goals of the Paris Agreement, and that the strategy is generally in line and, where appropriate, coordinated with the Paris Agreement. While a global and consensus-based approach under the IMO is preferable, the implementation of the strategy needs to be adequately ambitious to ensure that the sector makes a fair contribution to the climate problem. IMO member states, who at the same time are parties to the Paris Agreement, have a responsibility to ensure an effective industry contribution.

Working out the details of a fair contribution from the sector is complex. The answer to what is a fair contribution can be expected to change over time. Further work is needed to clarify the action measures under the strategy that will constitute an appropriate contribution from the international shipping sector, based on its unique circumstances, the likelihood and timing of technological breakthroughs, and how the circumstances compare to those in other key sectors. However, debates over the details in the strategy on what would amount to a fair contribution should not delay action, as the basic message from the Paris Agreement is that all sectors must decarbonize as rapidly as reasonably possible, and that, ultimately, all sectors need to make all reasonable efforts to achieve full decarbonization.

Until the strategy's details of a fair contribution from this sector are worked out, the strategy should be implemented on the assumption that the international shipping sector needs to decarbonize at the same rate as other sectors. In other words, the initial strategy should be implemented on the assumption that the sector is neither required to do more nor less than other sectors. This means the rate of emissions reduction should be the same as the rate of emissions reductions needed globally, and that the dates for key milestones such as peak emissions, GHG neutrality and full decarbonization are the same as what is needed globally. These starting assumptions can then be refined over time, as the unique circumstances of the shipping sector, and how they compare to the unique circumstances of other sectors, are better understood.

The ultimate measure of what is needed globally is the long-term goal of the Paris Agreement. Unfortunately, much of the analysis currently available on the global effort needed is based on the pre-Paris goal of 2°C, not on the Paris goal of "well below 2°C," with efforts to "limit increases to 1.5°C." The IPCC's Fourth Assessment Report provides key parameters on what is needed globally to stay within 2°C, and the Paris Agreement itself sets a long-term objective of reaching GHG emission neutrality in the second half of the century that appears to be based on the 2°C analysis of the IPCC.

Until the IPCC releases its report on 1.5°C, a pragmatic approach would be to rely on the IPCC's Fourth Assessment Report, but with a clear understanding that the long-term goals will have to be updated in light of the 2018 IPCC report on 1.5°C. The implementation of the IMO strategy's long-term vision and action measures should be informed by the Paris Agreement goal and the IPCC's Fourth Assessment Report, using the 2008 peak year for the sector and working toward rapid decline of emissions thereafter, thus leading to GHG emissions neutrality by or before 2050, with the details depending on the results of the IPCC's expected report on 1.5°C. The ultimate goal would be the full decarbonization of the sector.

It is also clear that innovative solutions are needed to implement the NMFT and CBDR principles in the IMO strategy's approach to GHG emissions reductions from the international shipping sector. The two principles now co-exist in the strategy. Valid viewpoints have been expressed over the years, both by developing countries concerned about the economic impact of GHG emissions

reduction efforts and by others, concerned about the differential treatment of private actors within the industry. The separation of the treatment of industry actors in the strategy from the treatment of state parties offers an opportunity to harmonize the application of the two principles in the implementation of the IMO strategy.

Action measures should aim to preserve the principle of NMFT for industry actors within the international shipping sector while finding ways to address legitimate concerns about economic impacts on vulnerable developing countries. Their concerns, and especially those of the LDCs and SIDS, must be taken seriously and measures in support must be properly resourced. Such an approach would be in line with the aspirations of the SDGs and the nuanced and pragmatic approach to CBDR adopted in the Paris Agreement, and may be key to overcoming the impasse over the application of these two principles. Cooperation between the UN climate regime generally in the spirit of the Paris Agreement, and utilization of the institutions and mechanisms under the Paris Agreement in particular, offer promising opportunities to move forward constructively in this regard.

Key elements of the IMO strategy relate to capacity building, technical cooperation and technology access. Cooperation between the IMO and the technology, capacity and funding mechanisms under the Paris Agreement have the potential to overcome barriers to effective implementation of GHG reduction technologies in key developing countries through proactive and supportive measures. If an MBM is introduced, consideration should be given to channelling some of the funds generated to support R&D that will produce innovations in the public domain. Ultimately, a critical ingredient of any solution is the commitment to ensure the international shipping sector contributes its fair share to addressing the climate crises in a manner that is fair to vulnerable developing countries and fair to the private actors involved in the industry. The application of NMFT and CBDR principles needs to be undertaken in a symbiotic manner to serve the ultimate goal of a fair contribution.

This report has considered the efforts of the IMO in three phases (short-, medium- and long-term), following the approach taken in the organization's initial strategy. The strategy's phased short term (referring to the period between now and 2023),

the medium term (from 2023 to 2030), and the long term (from 2030 to full decarbonization), while appropriate at this time, might need to be reconsidered as the need for more ambitious climate action becomes increasingly urgent. What is needed in terms of specific measures to guide parties through the three stages is the appropriate combination of ambition, flexibility, adaptability, and transparency to meet the goals of the strategy in a timely, efficient, effective and fair manner.

A combination of technical and operational standards, market-based instruments, other measures and effective compliance and enforcement will likely be needed to address the challenge, carefully designed to motivate all key actors to take effective and adequate measures to decarbonize the international shipping sector. The current technical measures offer an important starting point and will require effective and timely mechanisms to keep pushing for the development and implementation of best available technology, to update the requirements on a regular basis as technological breakthroughs are achieved. The EEDI, in particular, designed to be scaled up every five years, will play a vital long-term role. Market mechanisms or other novel effective measures are needed, primarily to motivate and enable the technological breakthroughs that can then be implemented either through upgraded technical standards or through the market mechanism itself to achieve the full decarbonization of the sector.

If MBMs are utilized as part of the strategy, the detailed design will matter more than the choice of instrument, such as the choice between a carbon levy or a cap-and-trade system. The most fundamental question is whether the mechanism will focus on in-sector emissions reductions or offer (limited or broad) access to credible out-of-sector emissions reduction opportunities. It is important to recognize that there are pros and cons to both, and that the choice will have implications for how the long-term goals are framed and for the timelines. One implication of this choice, for example, is the need and importance of the technical and operational regulations. An in-sector approach to a market mechanism may serve to achieve full decarbonization of international shipping, whereas an out-of-sector approach is more likely to need an evolving and carefully designed technology mechanism to ensure the sector ultimately achieves full decarbonization.

There are a number of elements of the IMO strategy and its implementation that will require regular review and adjustment to ensure the goals are met, including the fair contribution from the sector, the technical standards of vessels and their operation, and any market-based or regulatory mechanisms designed to motivate technological innovations and their adoption. The five-year review cycles under articles 13–15 of the Paris Agreement, built around the global stocktake, offer a valuable structure and timetable for reviews of progress and effectiveness of the elements of the overall approach. A well-synchronized review that both takes advantage of the information gathered and feeds appropriate information into the five-year review cycles under the Paris Agreement would enhance efficiency and effectiveness of the IMO strategy.

Other elements to consider include existing efforts on transparency and review within the shipping sector, including current efforts under the IMO and include future changes to its governance, but also efforts outside the IMO, such as the EU MRV. Ultimately, for transparency and effectiveness, regular reporting, review and enhancement of the approach, in synch with reporting and review under the Paris Agreement and elsewhere, will be critical for the effective implementation of the IMO strategy.

Legal Considerations for the Strategy

While this report concludes that the general approach to GHG emissions reductions from ships in the IMO strategy should be integrated, the implementation of the strategy will require a combination of global maritime regulation and other legal and policy measures. Regulatory tools to assist emissions reductions are obviously available to the IMO, but it likely will be necessary to consider a basket of mechanisms (maritime and other), especially with respect to a prospective MBM. An MBM, if adopted to complement technical and operational measures, will require legal support. To date, IMO regulation has concerned technical rules and standards for maritime safety, environmental protection and security concerns in shipping. The IMO convention most directly relevant to the regulation of emissions from ships is MARPOL, which, with its focus on technical standards for technology and operations, may need a novel addition, perhaps

a new chapter in Annex VI, preferably through the tacit acceptance procedure, to enable the introduction of a market measure in a reasonably timely manner. An MBM will require clear, consistent and predictable requirements and conditions for trading emission credits, and upon which private legal transactions will be based.

Alternatively, the MBM could perhaps be housed under article 6 of the Paris Agreement. At a minimum, consistency between any MBM developed under the IMO and the market mechanisms developed under article 6 of the Paris Agreement would be welcome. If IMO members decide to explore an MBM that includes access to out-of-sector reductions or offsets, it would be helpful to seek consistency with the emerging new Sustainable Development Mechanism under article 6.4 of the Paris Agreement.

The IMO has a long and successful history of a principled and structured approach to global maritime regulation. This approach has usually been evidence-based and pragmatic, has employed both mandatory and voluntary approaches, and has aspired to universalize its instruments and facilitate uniformity in their implementation. While the GHG strategy is expected to be guided by a vision at a high level of generality, accompanied by aspirational goals, the fulfilment of those goals will require a mixture of mandatory (possibly concerning the EEDI and fuel requirements) and voluntary rules and standards, and would need to be periodically reviewed and scaled up to enhance their continued relevance and effectiveness. As an instrument with a high degree of universal support, MARPOL's tacit acceptance procedure will be important to enable the gradual scaling up of the EEDI (in addition to the current five-year ratcheting cycle) and other standards.

A challenge for GHG regulation will be coherency in maritime regulation. As observed in this report, the pursuit of ship operation regulations in various domains may potentially raise issues for the regulation of GHG emissions, such as other atmospheric emissions from ships (for example, to control NO_x, SO_x and PM emissions), particular technical and operational requirements for environmental reasons (for example, ballast water exchange operations), energy use by particular ships (for example, polar-class vessels) and safety concerns (for example, safe vessel speed). It is possible that efforts to address GHG emissions may conflict with other regulatory efforts. While

potentially adding more complexity to GHG regulation, this concern calls for an integrated approach to GHG regulation where impact on other regulated matters will need to be addressed.

The integrated approach to maritime regulation also calls for regulatory coherency and fairness across the industry. Careful thought will have to be given in the detailed design and implementation of the strategy to the public and private law impacts on the roles of the many actors in the industry, from regulators and enforcers (flag states/maritime administrations, port states), to ship operations (shipowners, charterers, operators, managers), to providers of services to ships (port services, bunker suppliers, insurers). Ways of facilitating universal acceptance and uniform implementation need to be anticipated at the design stage.

Coherency in GHG regulation should also be pursued across international and national standards to maximize GHG emissions reduction from all forms of shipping. As observed in this report, the IMO efforts have focused on international shipping. Typically, the regulation of cabotage, fishing vessels, small recreational craft and generally small tonnage is undertaken at the national level and the regulating state may choose to extend international standards to domestic shipping or regulate it separately. With respect to emissions of domestic shipping, overlap is to be expected between the international regime and domestic regimes. There is much to be gained by encouraging IMO member states to coordinate the regulation of GHG emissions from all forms of shipping in a consistent manner to enhance mitigation from this sector as a whole.

An interesting factor in the future implementation of the IMO strategy is the relationship between the IMO conventions and the UNFCCC, its subsidiary agreements (Kyoto and Paris), as well as other treaty regimes (such as the WTO). The IMO has a legal mandate as the competent international organization with respect to international shipping matters, and this has been recognized by the expectation that the organization will orchestrate the industry's fair share of emissions reductions. The IMO has gone to great lengths in developing and maintaining a constructive relationship with the UNFCCC process (including the UNFCCC Secretariat and SBSTA) and has provided regular reports. A potential concern is the possibility that the implementation of the IMO strategy does not display sufficient ambition and does not deliver a

substantial and effective contribution, especially in comparison to NDC commitments and other industries. If this scenario, however unlikely, arises, there could be an issue between, on the one hand, the UNFCCC/Paris Agreement mandate that includes all GHG emissions (including shipping), and, on the other hand, the IMO mandate as a UN special agency and competent organization under the IMO Convention and the LOSC. If a future Paris Agreement COP were to engage more closely with international shipping, they would likely be able to do so only by establishing a target, while the IMO would retain the maritime regulatory capacity (technical and operational, as expected because of its competence under its constitutive instrument and the LOSC) to facilitate the achievement of that target. In any event, it is important to reiterate that IMO leadership at a high level of ambition on this issue is critical.

There are opportunities for coordination of and cooperation under different international regimes to meet GHG emissions reductions. The LOSC has a complementary relationship to the Paris Agreement and IMO maritime conventions. Although some IMO member states have expressed concern about a potential conflict between MBMs and the WTO rules, the potential interaction between GHG emissions regulation from international shipping, the formulation and implementation of NDCs, and the WTO regime are deserving of further study. The idea proposed in a recent CIGI special report to create a “climate change waiver”⁵³⁴ to the WTO rules is likely worth studying further. In the meantime, measures should be taken to avoid any perceived or real conflict with the WTO rules, but this should not delay or undermine the implementation of an effective approach to GHG emissions reductions from international shipping. From another perspective, bearing in mind that state parties to the IMO conventions are also member states of the WTO, an MBM developed and adopted by consensus in the IMO might also render the matter a non-issue.

Finally, the process to produce a revised IMO strategy by 2023 will need to consider the approach to promoting compliance. The initial IMO strategy is essentially a framework for future action. The vision is aspirational and the commitments non-binding. At this time, the strategy does not address compliance. This is a weakness and can be expected to pose a challenge for encouraging conduct that is consistent with the strategy, itself a legally unenforceable instrument. The implementation of the strategy relies on action measures as yet to be adopted. Ideally, those measures should include technical and operational rules, standards and codes adopted under MARPOL Annex VI, especially if mandatory. Flag states will continue to have primary responsibilities for ensuring effective jurisdiction and control with respect to GHG regulation of their ships. Port state enforcement will continue to play an important role and is likely instrumental for the future success of the strategy.

⁵³⁴ Bacchus, *supra* note 138, 22–27.



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