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Inspirations from Sustainable Maritime Development

by

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Sustainable International Civil Aviation

The attached Occasional Papers have been prepared by a group of scholars associated with the Institute of Air and Space Law (IASL) at McGill University. They are the result of a collaborative effort between the IASL and the Centre for International Sustainable Development Law and are designed to be part of a book prepared by authors from both groups which will eventually be published by the Cambridge University Press under the title *Sustainable International Civil Aviation*.

As the title of the book suggests, bringing together these various scholars and papers is the central theme of the sustainable development of international aviation. In particular, the work of the International Civil Aviation Organization (ICAO), the primary United Nations body tasked with regulating the environmental aspects of international aviation, and the provisions of the Chicago Convention which lays down powers of the Organization and the fundamental rules of international air law, form the primary focus of this collection. At the next ICAO Assembly in September-October of 2016, ICAO has the ambitious mandate to finalise a global scheme to limit CO2 emissions from international aviation. As many of the articles contained in the book are of immediate relevance to the discussions due to take place at ICAO, publishing and disseminating these draft chapters will contribute to the growing interest and debates on the issue of the environmental impact of aviation. It is hoped that these papers will contribute to the work of the Assembly and that informed readers and delegates participating at the ICAO Assembly will have constructive comments to share with the authors.

Readers are invited to send their comments to the authors whose e-mail addresses are set out on the title page of each paper as well as a copy to the following address: edannals.law@mcgill.ca

The authors and the Editors of this collection of papers thank all readers for their attention and their comments.

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SUMMARY

Environmental protection in the global shipping industry: What are the lessons that can be applied in the aviation industry?

The issue:

- What are the historical roots of sustainable development in the maritime industry?
- What is the role of the International Maritime Organization (IMO) in environmental protection?
- How does IMO address the problem of greenhouse gas (GHG) emissions?

Its importance:

- The Aviation Industry can gain lessons from the experience of the Maritime Industry on the reduction of GHG emissions.
- The Aviation Industry can also learn international regulatory framework present in the Maritime Industry.

The treaty law:

- International Maritime Organization Treaty
- International Convention for the Prevention of Pollution from Ships as amended by its 1978 Protocol (MARPOL)

The analysis:

- The creation of IMO lead to the regulation of environmental protection and the promotion of sustainable development in the maritime industry. It can be regarded as the maritime counterpart of the International Civil Aviation Organization (ICAO). Unlike ICAO, IMO has a particular competence for binding (and detailed) regulation under universally accepted treaty instruments such that the compliance of its Member States, or at least their obligation to implement regulatory measures, is assured.
- A milestone was achieved in the sustainable development in shipping when the 1973 International Convention for the Prevention of Pollution from Ships (and later on amended by its 1978 Protocol or "MARPOL") was adopted. MARPOL is a regulatory code that is being constantly revised. In the 1990s, it was revised to

provide for air emissions from ships in order to protect coastal air quality and, thereby, human health, which established the basis for GHG control measures.

- MARPOL by itself lacked provisions for the enforcement among Member States. Instead, the approach is for Member States to enact their own legislation to adopt the treaty's detailed regulation.
- The success of IMO is attributed to the following features: (1) IMO's role in shipping safety for more than half a century; (2) the creation of a secretariat that ensures administrative coordination of complex matters; and (3) the creation of now-monolithic treaties for regulation that are capable of ready amendment and having new subjects grafted onto them.
- The success of sustainable development in shipping has been premised on an increasing acceptance and the development of the rule of law in the international order, together with a coherent regime in the SOLAS-MARPOL treaty family now universally accepted by shipping States, and the legitimacy of IMO not being competed with by other agencies, and to which States increasingly resort for negotiated, uniform standards across the industry.

Options for decision-makers:

- 1) States to adopt an instrument similar to MARPOL in the Aviation Industry.
- 2) ICAO to emulate the attributes of IMO that led to the latter's success.

INSPIRATIONS FROM SUSTAINABLE MARITIME DEVELOPMENT

by

Jeffrey J. Smith*

ABSTRACT

This chapter addresses the historical, international and legal roots of environmental protection in the global shipping industry. The discussion begins with a review of the initial efforts among states to regulate the industry and the creation of the International Maritime Organization. The original maritime environmental treaties of the 1960s are considered and the early success of a 1973 global treaty then assessed. The particular challenge of regulating greenhouse gas emissions under the UNFCCC-Kyoto Protocol is considered. Concluding lessons from the regime are offered.

KEYWORDS

International Maritime Organization · Environmental protection · SOLAS · MARPOL · UNFCCC · Kyoto Protocol · Shipping · Greenhouse gas emissions

I. INTRODUCTION

The growth of maritime transportation has continued relentlessly in the twenty-first century. One need only to visit the great port cities of the world – Hamburg, Hong Kong, Rotterdam and Singapore – to confirm the fact that humanity trades significantly by sea. Maritime transport, after the advent of safer navigation practices, improved technology and ever-decreasing operating costs, has never been more efficient or widely available to states and commercial enterprise. The revolution in shipbuilding and the ubiquity of maritime trade which launched by the invention of the steam engine two centuries ago is certain to continue.¹

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¹ The United Nations Conference on Trade and Development, UNCTAD, reports that the world commercial shipping fleet increased by at least 3.5 per cent each year over the decade until 2015, reaching 89,464 vessels with a total cargo capacity of 1.75 billion tonnes (*i.e.* tonnes deadweight), carrying 9.84 billion tonnes in 2014 – four-fifths of all merchandise trade. UNCTAD, *Review of Maritime Transport 2015* (New York, NY: United Nations, 2015) pp. x and 5.

As with all transportation, whatever the specific human use and setting – national and international – maritime shipping has certain costs, that is, externalities beyond its industry. One that continues to be grappled with is the environmental impact from the construction, operation and dismantling of ships. In response, the approach has been remedial, pursued by regulators including national governments and the International Maritime Organization (IMO) from the 1950s to the present, for the most part incremental in the wake of high profile disasters. After oil pollution concerns in the 1960s came regulation of operator competence to avoid catastrophic ship losses, then the better design of ships with particular risks (such as roll on-roll off vehicle ferries, and bulk carriers) and, more recently, air emission controls in populated coastal areas. These advances, increasingly negotiated and implemented by states through the IMO, have not occurred in isolation from each other. They have proceeded alongside the IMO's great project to regulate for the safety of life at sea. And environmental protection in the maritime industry has advanced under the aegis of significant state commitment and implementation of measures in the 1982 United Nations *Convention on the Law of the Sea*.²

This chapter surveys the landscape of environmental protection and sustainable development in the international maritime industry. The review is necessarily historic, because the remedial dimensions of early responses to environmental impacts and creating sustainable shipping are useful to gauge the future development of regulation and the limits of legal responses. Treaty-making by states in the IMO and in bilateral, regional and global settings is then considered. This activity, at least until recently, has been successful, ensuring the safer operation of cleaner ships. The particular issues of oil pollution, harmful air emissions and pollution from the dismantling of ships – all to be regulated by treaties of global application – are reviewed. The challenge of reducing greenhouse gas (GHG) emissions is addressed, particularly for cross-regime lessons in aviation. Thematic observations are also made in an effort to assess the maritime industry's developmental arc toward sustainable development.³

² *United Nations Convention on the Law of the Sea* (December 10, 1982) 1833 UNTS 397 (in force November 16, 1994) (UNCLOS). As of December 2015, 167 states including the European Union have acceded to or ratified UNCLOS.

³ *Sustainable development* is a modern term, assigned importance as the principal definition of the conduct of economic progress with regard to environmental protection. It entered the policy-making canon of states and international organizations including the ICAO and the IMO following the report of the UN General Assembly established World Commission on Environment and Development, *Our Common Future* (Oxford: Oxford University Press, 1987), also known as the Brundtland Commission Report. "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs ... In essence, sustainable development is a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development; and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations." *Ibid.*, Chapter II, paras. 1 and 15. The Agenda 21 priorities that resulted from the 1992 UN Conference on

II. THE HISTORICAL ROOTS OF SUSTAINABLE DEVELOPMENT IN THE MARITIME INDUSTRY

The world's maritime states have long regulated the environmental impacts of shipping. Their concern, for the most part, was about what ships would discharge in port: wastes fouling local waters, and ballast materials discarded into shallow areas.⁴ Until the nineteenth century states took little interest in maritime jurisdiction beyond their immediate coastal areas, and none in respect of environmental matters. The change after 1800 toward national jurisdiction in the offshore, at first in Scandinavia, and then in continental Europe and the United Kingdom, was attributable to technology, primarily the advent of the marine steam engine, but also iron-hulled ships, improvements in navigation methods, and communication by undersea telegraph cable.⁵ The growth of mechanized seaborne trade after the middle of the century would see a rise in the loss of ships and lives, a phenomenon resulted in the first efforts of government to regulate safety at sea. One example is the standards for basic vessel construction and stability pursued by Samuel Plimsoll, the reforming member of the United Kingdom Parliament.⁶

It was the large loss of life in the sinking of the RMS *Titanic* in 1912 that resulted in the start of collective regulation for maritime safety among states. The first Safety of Life at Sea (SOLAS) treaty quickly followed, but never became effective because of the First World War.⁷ The widespread adoption of oil fuel for ships, in preference to coal, during the next decades created the industry's original pollution problem: What to do with waste oils that were uneconomical to retain and could not be processed aboard? The response was the 1954 *International Convention for the Prevention of Pollution of the Sea by Oil*.⁸ The Convention regulated operating waste and tank washing discharges from all ships but not the accidental loss of oil from tankers. This, too, was a period of technical change; commercial vessels

Environment and Development and those in the 2012 "The Future We Want" declaration of the 2012 Río + 20 conference have consistently applied the concept.

⁴ See e.g. the United Kingdom *Thames Conservancy Act*, 1932, 22 & 23 Geo. 5, c. xxxvii. Section 121 prohibits "any substance which has been used as ballast" from being deposited in the Thames River. The statute originates from the 1535 *Thames Conservancy Ships' Ballast, etc., Act*, 28 Hen. VIII, c. 18.

⁵ In some respects, such developments resulted in, and were driven by decisions of European states at the Conference of Berlin in 1884-85 to divide colonial areas among them, notably in Africa. Efficient maritime transport had brought the last economically attractive areas within efficient reach of colonial powers.

⁶ The concern of the era was to preserve lives at sea. See N. Jones, *The Plimsoll Sensation: The Great Campaign to Save Lives at Sea* (London: Little Brown, 2006).

⁷ *Convention for the Safety of Life at Sea* (January 20, 1914) (London: HMSO, 1914). The 12 states participating committed to adoption of prescribed measures in their national legislation and to a follow-up conference by 1920. Subsequent conferences which resulted in modest technical and operating prescriptions for commercial vessels were held in 1929 and 1948.

⁸ (May 12, 1954) 327 UNTS 3 (in force July 26, 1958). By 1954, the customary international law obligation for states to prevent transboundary pollution and to warn others had been established, confirmed by the *Trail Smelter (Canada v. USA)* and *Corfu Channel (United Kingdom v. Albania)* decisions.

becoming larger in all categories (e.g. bulk carriers, tankers and passenger vessels), constructed and registered in more countries, and the change in ship propulsion away from the large, inefficient triple expansion engine to the steam turbine and internal combustion diesel.⁹

The 1950s also brought the codification of international maritime law, a project originally conceived in the League of Nations era. This would have a significant influence on common understandings of states' environmental obligations for shipping in following decades. In 1956 the International Law Commission had recommended such a step, thereby setting the stage for a conference in Geneva two years later.¹⁰ The continuing creation of new states, the growth in commercial fisheries extending across vast distances, and the start of the expansion among states to extended coastal areas contributed to a consensus that a treaty was needed. The 1958 conference yielded four instruments that would come to be the foundation of UNCLOS in 1982: (i) the *Convention on the Territorial Sea and Contiguous Zone*; (ii) the *Convention on the High Seas*; (iii) the *Convention on Fishing and Conservation of Living Resources of the High Seas*; and (iv) the *Convention on the Continental Shelf*. That principles long accepted by states could be reduced to treaty provisions fostered confidence that a balance might be maintained between traditional rights and access to maritime resources with acceptable restrictions.¹¹

III. CENTRE STAGE: THE ROLE OF THE INTERNATIONAL MARITIME ORGANIZATION

It was the creation of the IMO that lead to regulation of environmental protection and the promotion of sustainable development in the maritime industry. First styled as the Intergovernmental Consultative Maritime Organization (IMCO) under a 1948 UN sponsored treaty for shipping states, the IMO did not begin operation until a decade later.¹² It had a coordinating mandate "to provide machinery for co-operation among Governments in the field of governmental

⁹ After the Second World War there was a revolution in efficient propulsion for ships and aircraft, without which the growth in both industries would not have been possible. See V. Smil, "The two prime movers of globalization: history and impact of diesel engines and gas turbines." *Journal of Global History*, 2 (2007), 373-394.

¹⁰ See *Yearbook of the International Law Commission* 1956 (Report of the International Law Commission on the Work of its Eighth Session, Official Records of the General Assembly, Eleventh Session, Supplement No. 9 (A/3159)).

¹¹ Respectively: (i) (April 29, 1958) 516 UNTS 205 (in force September 10, 1964); (ii) (April 29, 1958) 450 UNTS 11 (in force September 30, 1962); (iii) (April 29, 1958) 559 UNTS 285 (in force March 20, 1966); and (iv) (April 29, 1958) 499 UNTS 311 (in force June 10, 1964).

¹² *Convention on the Intergovernmental Maritime Consultative Organization* (March 6, 1948) 298 UNTS 3 (in force March 17, 1958), in 1977 the *International Maritime Organization Treaty* (the IMO Treaty). The IMO Treaty required ratification by 21 states, with at least 7 having commercial fleets exceeding one million tonnes. As of December 2015, 171 states were party to the treaty, several of them landlocked. Numerous states have declared on acceding to the IMO Treaty that the Organization should not exceed its mandate into areas of economic regulation.

regulation and practices relating to technical matters of all kinds affecting shipping engaged in international trade, and to encourage the general adoption of the highest practicable standards in matters concerning maritime safety and efficiency of navigation".¹³ Governance was to be through a biennial conference of parties delegating administration to an elected Council.¹⁴

Viewed from a distance, the IMO is the maritime analog of the International Civil Aviation Organization (the ICAO). Both organizations came into being during the era of great expansion of global trade, creation of international organizations and the independence of new states, both functioning in their governance roles by significant consensus mechanisms and the participation of actors from their commercial industries. And regulatory measures shaped in each of the ICAO and IMO are increasingly universal, adopted by states in the pursuit of uniformity, and the limits of their capacity for individual policy and administrative measures. The similarities should not be taken too far because the IMO has a particular competence for binding (and detailed) regulation under universally accepted treaty instruments such that member state compliance, or at least an obligation to implement regulatory measures, is assured.

Although the IMO then had no express treaty-making role, the new organization arranged the 1960 SOLAS II with the goal of creating a comprehensive instrument for common vessel construction and marine safety standards.¹⁵ Building on the event with a Secretariat able to obtain technical advice and coordinate proposed regulation-making, the IMO planned an ambitious agenda in pursuit of maritime safety. Some measures were anodyne, done in the pursuit of standard requirements not yet adopted universally among states such as the 1966 *Load Lines Convention*, while others were in response to technical advances in shipping such as nuclear powered vessels and prominent marine casualties.¹⁶

¹³ IMO Treaty, at Art. I(a). The IMCO had an important secondary trade role, namely to liberalize commercial shipping between states in order to eliminate discrimination in the use of nationally registered fleets.

¹⁴ IMO Treaty, Arts. 13-38. A 14 member standing Marine Safety Committee – with at least eight members from the largest ship-owning states – was created to pursue improvements to “aids to navigation, construction and equipment of vessels, manning from a safety standpoint, rules for the prevention of collisions, handling of dangerous cargoes, maritime safety procedures and requirements ... marine casualty investigation, salvage and rescue, and any other matters directly affecting maritime safety.”

¹⁵ *International Convention for the Safety of Life at Sea* (June 17, 1960) 536 UNTS 27 (in force May 26, 1965). Significant amendments were proposed from 1966 through 1973 but did not come into force because of the formula that they be accepted by two-thirds of member states.

¹⁶ *International Convention on Load Lines* (April 5, 1966) 640 UNTS 9159 (in force July 21, 1968). The convention marked the start of the IMO’s approach to providing for specific technical and operating matters by individual treaty instead of amendments to the 1960 and 1974 SOLAS treaties. Ships are required to carry current load line (loading capacity) certificates which are subject to being checked by a state in which a ship is loading in order to ensure safety. The measure is an early example of the comprehensive regime of port state control inspections for the safety of shipping which began in the 1980s in the aftermath of UNCLOS.

The 1965 sinking of the SS *Yarmouth Castle* between Miami and Nassau was a typical casualty of the

Several events put environmental protection in the maritime industry firmly on the agenda of states and the IMO. One was the loss of the large oil tanker m.v. *Torrey Canyon* off southwest England in March 1967.¹⁷ A second was the decision of the UN General Assembly the following year to begin preparatory work for the UN Conference on the Human Environment that would take place in Stockholm in 1972.¹⁸ The third was the General Assembly's recognition that a comprehensive law of the sea regime would be useful, and that negotiations for it should be pursued.¹⁹ Humanity's sense of the limits of the environment was evolving.²⁰ The call by civil societies in many states that their governments must act was growing.

A milestone in the sustainable development of global shipping was the 1973 treaty to regulate the "harmful discharge" of substances from ships into the marine environment, the *International Convention for the Prevention of Pollution from Ships*.²¹ At first, MARPOL regulated only the prevention of oil pollution from ships, replacing the 1954 convention. The 1973 treaty would be amended in 1978 to include pollution from noxious substances. To these Annexes I and II of the treaty were added measures to control pollution from packaged substances (Annex III, in force in 1991), sewage from ships (Annex IV, in force 2003), garbage discharge (Annex V, in force 1998) and air pollution (Annex VI, in force 2005). These entry-into-force dates can be misleading because new technical regulations are now adopted regularly across the annexes, as they are for ship design and construction under SOLAS. MARPOL, in other words, is a regulatory code for the prevention of marine pollution that is being constantly revised. The advances in such regulation were only possible because of the creation in 1974 of the IMO's Marine Environment

time, one resulting in regulatory changes. See US Coast Guard, "Marine Board of Investigation: SS Yarmouth Castle" (February 23, 1966) (Washington, DC: Department of the Treasury).

¹⁷ The *Torrey Canyon* incident resulted in the first multilateral oil spill response treaty, the *International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties* (November 29, 1969) 970 UNTS 212 (in force May 6, 1975), accompanied by the 1969 *International Convention on Civil Liability for Oil Pollution Damage* and the 1971 *International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage*.

¹⁸ UN General Assembly Resolution 2398 (XXIII), "Problems of the Human Environment" (December 3, 1968). The Preamble called "for intensified action at the national, regional and international level in order to limit and, where possible, eliminate the impairment of the human environment [and] to protect and preserve the natural surroundings in the interest of man".

See Declaration of the United Nations Conference on the Human Environment (June 16, 1972), UN doc A/Conf.48/14/Rev. 1 (1973).

¹⁹ UN General Assembly Resolution 2750 (XXV) (C), "Convening of a conference on the law of the sea" (December 17, 1970).

²⁰ Another factor was the continuing expansion in maritime zones by coastal states including fishery areas to 200 nautical miles offshore. A typical case of the conflict between states was *Fisheries Jurisdiction (United Kingdom of Great Britain and Northern Ireland v. Iceland)*, Merits, ICJ Reports 1974, 3.

²¹ *International Convention for the Prevention of Pollution from Ships* (November 2, 1973) 1340 UNTS 184 (in force October 2, 1983), amended by its 1978 Protocol (MARPOL).

The IMO had also seen to negotiations for the *Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter* (December 29, 1972) 1046 UNTS 120 (in force August 30, 1975). This was a treaty to regulate disposal of wastes from land, such as dredging materials from coastal areas and derelict ships, one arguably not within the IMO's burgeoning environmental mandate.

Protection Committee (the MEPC) coupled with the later agreement of member states that stringent standards for pollution control could be adopted in geographically designated “special areas” (for Annexes I, II, IV and V) and “emission control areas” to regulate sulphur oxide (SO_x) and nitrogen oxide (NO_x) emissions in coastal areas under Annex VI.²²

MARPOL lacked provisions for enforcement among member states, instead the approach to be that states would enact their own legislation to adopt the treaty’s detailed regulations. As such, the IMO’s environmental regime can be thought of in four layers: (i) the IMO Treaty; (ii) the wide-ranging *Safety of Life at Sea Convention* (SOLAS) framework; (iii) MARPOL itself; and (iv) measures prescribed by as resolutions of the MEPC.²³ It was the 1983 entry into force of MARPOL Annex I together with the concept of regional seas environmental agreements created under a just-concluded UNCLOS, as well as port state control agreements by which like-minded states in various regions would inspect and require the fixing of sub-standard shipping, that ensured widespread, consistent compliance by the industry.²⁴ These elements of enforceability are integrally part of the marine environmental protection regime for shipping that prevails today.

From a rule-making perspective, the IMO was successful in a relatively short period of time because of several features of its governance framework. The first of these has been the Organization’s role in shipping safety for more than a half century, a focal point for states to arrive at common, detailed technical standards for regulation of the industry. The second was the creation of a secretariat led by the authority figure of the IMO Secretary-General, ensuring administrative coordination of complex matters. In an era that now takes as common the administration of treaty bodies by standing secretariats, this innovative step should not go unrecognized.²⁵ A third feature was the creation of now-monolithic treaties

²² For a list of such areas, see the IMO website: <https://www.imo.org>

Emission control areas are negotiated between coastal states concerned before being adopted by the IMO through the MEPC. See the US Environmental Protection Agency explanation of that created for Canada, France and the United States in North America in 2012, “Designation of North American Emission Control Area to Reduce Emission from Ships” (US EPA: Ann Arbor, March 2010).

²³ Treaty-making for safer shipping has been extensive through the IMO, from the 1977 Torremolinos International Convention for the Safety of Fishing Vessels to the International code of safety for ships operating in polar waters (the Polar Code) expected to enter into force in 2017.

²⁴ Regional seas marine environmental protection areas now exist in numerous areas, including the North Sea, the Baltic, the Mediterranean, the Arabian/Persian Gulf and west Africa. See United Nations Environment Programme: [www.unep.org/regional seas](http://www.unep.org/regional_seas)

UNCLOS Article 219 requires a port state to assess a ship that may be unseaworthy and “thereby threatens damage to the marine environment”, and permits such a ship to be detained and repaired. Port state control agreements (memoranda of understanding) for the exchange of information about sub-standard ships now exist in most shipping areas of the world and between all significant commercial ports. See that for Europe, the 1982 Paris MoU, at: <https://www.parismou.org>

²⁵ Credible secretariats confer actual and perceived competence. Within the IMO, the presence of the MEPC as a standing entity with program continuity and credibility in the pursuit of negotiated technical rules exemplifies this. See G. Ulfstein, “Reflections on institutional design – especially treaty bodies” in J. Klabbers and A. Wallendahl, eds., *Research Handbook on the Law of International*

for regulation that are capable of ready amendment and to having new subjects grafted onto them, for example the addition of a physical security code to SOLAS in the late 1990s. This success has not been easy, but we should recall that the core of marine safety governance (and therefore environmental protection) can be captured in detailed rules to readily form the basis of treaties, in contrast to more ethereal operating principles, human factors measures and economic standards. Common agreement to such things as load line standards and tonnage rules may be easily achieved. But the SOLAS system with its many detailed instruments, including MARPOL, itself now a wide-ranging codification, could not have held without a high degree of confidence among states.²⁶ The fourth feature of such consensual rule-making success has been the entry-into-force and amending formulae in the suite of IMO treaties. They have ensured a negotiated result will be made operational through a tacit acceptance process, a problem that persists in multilateral environmental treaties of general application.²⁷

All environmental treaty-making has limits. The global distribution and ownership of commercial ships reflects this acutely. State administrations may not have sufficient capacity to prescribe and implement MARPOL and related rules. Addressing sub-standard ships – the category of which disproportionately account for maritime accidents and environmental problems – is a constant demand on governmental resources. The IMO has recognized this and that is why environmental standards are increasingly accompanied by soft standards or guidelines developed by the Organization. Some examples include: (i) the *Polar Code* in its post-2002 inception phase as “guidelines” of recommend practice for ships operating in ice-covered waters; (ii) “goal based construction” standards for the improved design and building of ships to ensure their in-service reliability and therefore the avoidance of accidents; and (iii) addressing the environmental impact of ships in their routine operation by creation of recommended practices to detail construction materials and for their end-of-life dismantling.²⁸

Organizations (Cheltenham, UK: Edward Elgar, 2011), pp. 431-447.

²⁶ Marine classification societies such as Det Norske Veritas-Germanischer Lloyd, Bureau Veritas, Lloyd’s Register and the American Bureau of Shipping have been influential in improving shipping standards and performance. The International Association of Classification Societies has a pronounced role as an observer member of the IMO MEPC.

²⁷ Amendments to SOLAS and MARPOL have a long inception period through recognition of a needed rule change, to negotiation, and then implementation. The *Polar Code* is an example. First proposed as guidelines in 2002 and revised in 2010, it was adopted by IMO states in 2014 for application in 2017 to newly constructed ships and in 2018 to all others trading in polar waters.

²⁸ In 2009 the IMO Assembly adopted the *Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships* (May 15, 2009) IMO doc. SR/CONF/45 (not in force). Article 17 provides for entry-into-force 24 months after: (i) ratification by 15 states; (ii) ratification by states which have registered between them at least 40% of the tonnage of global commercial shipping; and (iii) the first 15 (or any greater number needed) ratifying states achieving a maximum annual ship recycling (*i.e.* dismantling) volume not less than three per cent of the combined tonnage such ratifying states during the past 10 years. The convention resulted from a sustained concern in some civil societies and among flag states, including European Union institutions, of the human health impacts and environmental degradation of what was a largely unregulated industry in a few

IV. SUSTAINABILITY AND ITS CHALLENGE FOR THE IMO: CLIMATE CHANGE REGULATION

The regulation of greenhouse gas emissions from commercial shipping has presented the IMO its most complex environmental problem to date. A decade after the Kyoto Protocol came into force, a long-term solution – by treaty, guidelines or the consensus of IMO member states – has yet to be achieved. This is hardly surprising in light of the parallel experience of civil aviation, together with that of manufacturing and thermal power generation industries within states. The 1992 UN *Framework Convention on Climate Change* made no provision for control of GHGs from shipping or the maritime industry.²⁹ It would fall to the Convention's 1998 Kyoto Protocol to confer the needed regulation to the IMO. This was not a delegation as such, but the agreement of contracting states that the issue would be addressed through the IMO.³⁰ MARPOL would be the focal point for the needed regulation because it had a developed regime for air emissions standards and its universal acceptance among shipping states. However, because the regulation of GHGs has a substantial economic aspect, there would be limits in a traditional, formal approach to controlling a “pollutant” not attributable from case to case to a single point source and for which there was no ready technical solution.

MARPOL was revised in the 1990s to provide for air emissions from ships in order to protect coastal air quality and, thereby, human health. This established the basis for GHG control measures under Annex VI of the treaty after 2005.³¹ The first task under the new annex was to reduce NO_x and SO_x emissions that result from combustion of fuel, with the necessary measures then provided in Regulations 13 and 14 of Annex VI.³² The IMO's approach to more fuel efficient engines came out the need to reduce NO_x concentrations in engine exhaust. It is to be achieved in three stages through 2016.³³ The introduction in 2008 of Regulation 18 for fuel quality

developing states.

²⁹ *United Nations Framework Convention on Climate Change* (June 4, 1992) 1771 UNTS 107 (entered into force March 21, 1994) (UNFCCC).

³⁰ *Kyoto Protocol to the United Nations Framework Convention on Climate Change* (March 16, 1998) 2303 UNTS 148 (entered into force February 16, 2005) (Kyoto Protocol). Article 2(2) provides that: “The Parties included in Annex I shall pursue limitation or reduction of emissions of greenhouse gases not controlled by the Montreal Protocol from aviation and marine bunker fuels, working through the International Civil Aviation Organization and the International Maritime Organization, respectively.” The Montreal Protocol referred to here is that dating from 1987 for the control of ozone depleting substances. The IMO had started to regulate such substances, mainly refrigerants and solvents, by air emission standards in MARPOL Annex VI.

³¹ *IMO Policies and Practices Related to the Reduction of Greenhouse Gas Emissions from Ships*, IMO Assembly Resolution A.963(23) (March 4, 2004): www.imo.org.

³² See by comparison the directives of the European Environmental Agency and the European Commission, respectively at: www.eea.europa.eu/themes/air and ec.europa.eu/environment/air/quality/standards.htm.

³³ Tier I applies to ships constructed after January 1, 2000, for example restricting NO_x emissions to no more than 9.8 grams per kilowatt hour (g/kwh) at engine speeds greater 2000 RPM, and then to

required progressive elimination of sulphur from marine fuels, to concentrations of no more than 4.5 percent by 2012, 3.5 percent in the eight years following, and 0.5 percent after 2020.³⁴

The first Annex VI measures were helped by an increase in the cost of marine fuels after the 1990s which gave impetus to improved engine efficiency design and operational measures to reduce fuel consumption. Generally, at least 40% of the operating expense of commercial shipping – tankers, bulk carriers and containerships, although less so cruise ships and ferries – is the cost of fuel. Until the collapse in price of petroleum in the final months of 2014 the actual range was 50 to 60% (and higher in the case of large containerships).³⁵ Regulation of fuel consumption in ships has two challenges, namely, the inherent limits in the efficient conversion of fuel energy to motive power in diesel engines, and the capital cost for construction of ships with efficient engines. The UN Conference on Trade and Development (UNCTAD) expressed a preferred approach for the IMO in the following terms:

The aim is the adoption in 2009 of a binding, coherent and comprehensive IMO regulatory framework on GHG emissions from ships. IMO's Marine Environment Protection Committee (MEPC) agreed that, among other things, the framework should be: (a) effective, binding all flag States; (b) cost effective; (c) practical; (d) transparent; (e) fraud-free; and (f) easy to administer. It should have limited competitive distortion, support technical innovation, promote sustainable development and not penalize trade.³⁶

The same year, the IMO MEPC established a GHG Working Group that would develop an Energy Efficiency Design Index (EEDI) with mandatory application to newbuilds, and the Ship Energy Efficiency Management Plan (SEEMP) for all vessels.³⁷ These measures, added to Annex VI as Regulations 19–23, were adopted

7.7 g/kwh after January 1, 2011. (Comparable stepped reductions apply for engine speeds below 2000 RPM and below 130 RPM). Tier III requirements that came into effect on January 1, 2016 further reduced the NO_x emissions limit to 2.0 g/kwh. Tier III standards apply in designated coastal areas only, such as the Baltic Sea and North Sea Emissions Control Areas. Nitrous oxide is a GHG which is designated as such in the Kyoto Protocol.

³⁴ Nothing in Regulations 13, 14 and 18 of Annex VI is intended to reduce GHG emissions as such.

³⁵ There is no settled figure or model for costing fuel relative to (as a part of) the overall expense of capital acquisition, provisioning, operation and disposal of commercial vessels. Ship owners and operators know with great particularity such costs, which vary considerably by voyage route, crew competency, ship speed and loading. See generally Martin Stopford, *Maritime Economics*, 3d ed. (New York, NY: Routledge, 2009).

³⁶ UNCTAD, Summary of Proceedings: Multi-Year Expert Meeting on Transport and Trade Facilitation: Maritime Transport and the Climate Change Challenge, 16-18 February 2009, Geneva, UNCTAD/DTL/TLB/2009/1 (December 1, 2009) at 10.

³⁷ The EEDI and SEEMP were developed in 2010 and 2012 inter-sessions of the Working Group on Energy Efficiency Measures for Ships. States and technical organizations such as the International Association of Classification Societies (IACS) made proposals including for the establishment of baseline standards across various ship types.

in 2011 and became effective in 2013.³⁸ The EEDI at Regulation 21 is the most tangible of GHG reduction measures. Over a 10-year period, it is intended to result in up to 30 percent improved energy efficiency in several categories of ships propelled by diesel engines, although not “non-conventional propulsion” systems such as diesel-electric and gas turbine plants. In general, three phase-in periods provide for efficiency improvements of 10 percent (2015–2019), 20 percent (2020–2024), and 30 percent (after 1 January 2025) for vessels constructed in each period. Vessels are required to keep an International Energy Efficiency Certificate containing details of surveys and the maintenance of efficiency, and that will see ships being checked under the port state control regime.³⁹

Regulations 22 for SEEMP and 23 for technology transfer and cooperation round out the present Annex VI GHG framework. The SEEMP is a soft measure intended to promote the planning of fuel-saving measures in a ship’s operation.⁴⁰ It seeks improvements to “a ship’s efficiency through four steps: *planning, implementation, monitoring, and self-evaluation and improvement.*”⁴¹ As with aircraft, the speed of a ship is the primary determinant of fuel consumption and, therefore, efficiency on a unit basis of tonnage moved over distance. Accordingly, tangible operating procedures are geared to better voyage planning with more direct passages at lower average speeds. High fuel costs, which will increase in real terms notwithstanding the collapse of market price in the last months of 2014 because of the gradual elimination of heavy fuel oils under Annex VI Regulation 14 and 18 sulphur reduction targets, have forced ship owners and operators to consider such approaches.⁴²

Two economic factors will affect the success of this scheme, namely, continuing variations in the market price of ship fuels, and the operating costs of existing ships together with the capital cost of their replacement. When it comes to the latter, while shipyard capacity remains high (including in those states – China, Japan and South Korea – which build the majority of the global fleet captured by the Regulation 21 EEDI standard) and capital continues to be inexpensive, there is now an oversupply of ships that suggests new construction which has increased steadily since 2000 must necessarily decline.⁴³

³⁸ See IMO Resolution MEPC.203(62), IMO, 62th Sess, Annex 19 (2011) 1.

³⁹ Such ships are not required to be built to the Regulation 21 EEDI standard, but must demonstrate “attained” EEDI: Regulation 20. At present, ships entirely operating in national waters and those in government service are exempted from the EEDI scheme.

⁴⁰ 2012 Guidelines for the Development of a Ship Energy Efficiency Management Plan, Resolution MEPC.213(63), (2012) 1 at para 3.2 (SEEMP).

⁴¹ SEEMP at para 3.6.

⁴² See e.g. Germanischer Lloyd, *In Focus: Ship Efficiency & Emission Reduction* (January 2013): www.dnv.com.

⁴³ See the reports of the OECD Workshop on Shipbuilding and the Offshore Industry held on 24 November 2014. OECD, “Workshop on Shipbuilding and the Offshore Industry”: www.oecd.org See also UNCTAD, *Review of Marine Transport 2015*, pp. 30–34.

MARPOL has arguably reached its limits as a regulatory instrument to govern GHG reductions in the global shipping sector. The rules in Annex VI to ensure air emission quality – to reduce pollution that impairs human health – have worked through a combination of factors, including strong consensus for their creation, long introductory periods, the salutary effect of high fuel prices in recent years, a continuing trend of new shipbuilding, adoption and local enforcement of air quality standards by states, the supporting role played by marine classification societies, and the international nature of enforcement for shipping by a port state control inspection regime encompassing many areas of the world. IMO member states accept objective technical design and performance standards for shipping. But they have yet to allow additional cost and taxation-like burdens on national shipping industries, however fair or redistributionist that maybe. GHG reductions from global shipping have only just started, borne of a decade of experience with NO_x and SO_x emission control and, in 2015, efficiency standards for new ships.

Sustainable development in the global shipping industry has made impressive strides during the past half century. This success has been premised on an increasing acceptance and the development of the rule of law in the international order, together with a coherent regime in the SOLAS-MARPOL treaty family now universally accepted by shipping states. Where there has been a demonstrable human health concern (such as coastal air quality in air emissions from ships) or a high profile pollution incident, a remedial response has tended to emphasize the creation of durable regulations by the IMO. Another factor toward a sustainable regime has been the legitimacy of an IMO not competed with by other agencies, and to which states increasingly resort for negotiated, uniform standards across the industry. The greatest challenge for environmental protection in a robustly growing global shipping industry is, without doubt, climate change. Meeting it will demand technical innovation, a consensus among states and interested actors, and the use of international law as never before.

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