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Private Governance Can Increase Shipping's Efficiency and Reduce Its Impacts

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ABSTRACT

The shipping industry is a huge component of the world economy, and although it is often described as an efficient mode of transport, it still contributes as much carbon dioxide to the atmosphere as a major industrialized nation. Efficiency technologies and practices are available that would significantly lessen shipping's environmental impact, but "amazing loophole[s]" in international environmental law and a set of market failures have prevented them from being widely adopted. These problems have been studied before, but the public regulatory proposals being discussed run into steep, if not insurmountable obstacles. This Note argues that shipping inefficiency can be better addressed through private environmental governance. By operating privately, these forms of governance bypass the problems that traditional public regulation faces, allowing higher efficiency standards to be widely adopted without depending on political will. In so doing, private governance can better align the incentives of consumers, firms, and those firms' suppliers.

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I. INTRODUCTION

International shipping is already among the most efficient forms of transport,[1] but its contribution to climate change equals that of a major national economy.[2] Recent estimates show that in 2012 shipping accounted for approximately 2.2 percent of global carbon dioxide emissions.[3] These carbon releases are expected to continue to rise,[4] but full utilization of existing efficiency technologies and operational measures could reduce them by 30 percent or more.[5] Numerous examples of efficient technologies are already available. They range from concepts as simple as better hull coatings that reduce drag as a ship moves through the water, to slow-steaming to reduce fuel use, and even to novel applications of wind technology that supplement a ship's

1. INT'L CHAMBER OF SHIPPING, SHIPPING, WORLD TRADE AND THE REDUCTION OF CO_2 EMISSIONS 1 (2014), http://www.ics-shipping.org/docs/default-source/resources/environmental-protection/shipping-world-trade-and-the-reduction-of-co2-emissions.pdf?sfvrsn=6 (last visited Sept. 18, 2016) [https://perma.cc/38DC-2UZU] (archived Sept. 18, 2016) [hereinafter *ICS*].

2. EUROPEAN COMM'N, TIME FOR INTERNATIONAL ACTION ON CO2 EMISSIONS FROM SHIPPING 1 (2013) ("Emissions from maritime transport . . . [are] equivalent to more than the total annual emissions of Germany . . . .").

3. INT'L MAR. ORG., MARINE ENVTL. PROT. COMM., THIRD IMO GHG STUDY 2014 – EXECUTIVE SUMMARY AND FINAL REPORT 1 (2014) [hereinafter THIRD GHG STUDY].

4. *See* EUROPEAN COMM'N, *supra* note 2.

5. *Id.* (citing ERIC HEISMAN & CLAIRE DANIELLE TOMKINS, CARBON WAR ROOM, SHIPPING 3–4 (2011), https://carbonwarroom.com/sites/default/files/reports/Carbon%20War%20Room-%20Shipping%20Report_1_0.pdf (last visited Sept. 18, 2016) [https://perma.cc/F8E5-URQT] (archived Sept. 18, 2016)).

propulsion.[6] Efficiency-oriented tools allow shippers to reduce the carbon intensity of transport per unit moved,[7] and can be used to align the motives of those paying for transport with groups that seek emissions reductions by lowering fuel costs.[8]

These technologies are effective,[9] but several barriers prevent their widespread adoption. Inefficiency in shipping is a collective action problem with a global scope. Without a global scheme to price climate impacts, ship owners externalize the cost of their emissions. An individual ship owner who internalizes those costs by operating in an efficient way at the expense of speed-of-service places him or herself at a disadvantage relative to his or her competitors. Regulatory solutions are appropriate for collective action problems in some contexts, but are poorly suited for addressing inefficiency in shipping because shipping is international and strong participant biases resist adopting efficiency improvements.

Although public governance structures face steep challenges, several are either already in place or have been proposed in order to address shipping emissions. In 2013, the International Maritime Organization (IMO)—the United Nations (UN) agency tasked with regulating shipping—adopted fuel-efficiency standards which bind International Convention for the Prevention of Pollution from Ships (MARPOL) Annex VI parties.[10] In the same year, the European Commission published a strategy for incorporating maritime shipping emissions into the European Union's (EU) greenhouse gas reductions

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6. CRAIG EASON, LLOYD'S LIST, MAXIMISING SHIP EFFICIENCY: ENDING THE DEBATE 15–22 (2015) (describing options that an efficiency-conscious ship owner could employ, noting that "[t]he environmental argument has been driving shipping to become more fuel conscious, but so have fuel prices.").

7. T.W.P. SMITH ET AL., CO_2 TARGETS, TRAJECTORIES, AND TRENDS FOR INTERNATIONAL SHIPPING §1.3 (2015), http://www.tyndall.ac.uk/sites/default/files/co2_targets_trajectories_and_trends_for_international_shipping.pdf [https://perma.cc/MM7X-NKRN] (archived Sept. 18, 2016) ("In order for shipping emissions to remain within a given CO2 budget under scenarios of increasing transport demand, the CO2 intensity per unit of transport work will need to reduce.").

8. EASON, *supra* note 6, at 2.("The environmental argument has been driving shipping to become more fuel conscious, but so have fuel prices.").

9. *See infra* Section II.B (describing the technical feasibility of technical and operational measures designed to increase a ship's efficiency).

10. *See* Press Briefing, Marine Env't Prot. Comm., Mandatory Energy Efficiency Measures for International Shipping Adopted at IMO Environment Meeting (July 15, 2011) (http://www.imo.org/en/MediaCentre/PressBriefings/Pages/42-mepc-ghg.aspx#.Vg3Ek_lVikp [https://perma.cc/JTX6-UPGS] (archived Sept. 18, 2016)) ("Mandatory measures to reduce emissions of greenhouse gases (GHGs) from international shipping were adopted by Parties to MARPOL Annex VI . . . when it met for its 62nd session from 11 to 15 July 2011 [regulations adopted in 2011 would apply January 1, 2013] at IMO Headquarters in London, representing the first ever mandatory global greenhouse gas reduction regime for an international industry sector.").

efforts.[11] That strategy was codified as a regulation, integrating reductions of carbon emissions from maritime shipping into the larger picture of EU climate policy.[12]

But the disagreements about whether and how the Paris Agreement would address shipping's emissions exemplify why novel international agreements in this area are not likely to materialize. Prior to the 2015 UN climate summit in Paris, commenters suggested that emissions reductions from maritime transportation should be considered.[13] The Secretary-General of the IMO, on the other hand, forcefully argued that it should be the IMO that conducts any discussion of shipping's role in combating climate change, rather than the UN summit.[14] Environmental NGOs responded in kind, arguing that "[t]he IMO is misrepresenting the scope of shipping emissions, and . . . [that] it is too easily influenced by the shipping industry."[15] This dispute came at the tail end of years of discussion about how the EU should address climate impacts of shipping.[16] The summit's final product—the Paris Agreement—makes clear that those arguing for exclusion have succeeded in keeping shipping out of the agreement entirely.[17]

Diligent compliance with existing international instruments designed to address climate change could begin to address shipping's emissions, but is insufficient. Even the most recent of these

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11. *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 Has Reduction Policies* COM (2013) 479 final (June 28, 2013).

12. *See* 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 O.J. (L 123) art. 4.

13. Stephen Gardner, *UN Climate Chief Outlines Draft Text for Paris Summit*, 38 Int'l Env't Rep. (BNA) 1211 (Sept. 15, 2015).

14. *See* Koji Sekimizu, *Shipping and Climate Change: A Statement From IMO Secretary-General Koji Sekimizu*, INT'L MARITIME ORG., http://www.imo.org/en/MediaCentre/HotTopics/GHG/Documents/Shipping%20and%20climate%20change.pdf (last visited Sept. 18, 2016) [https://perma.cc/AB64-E4VU] (archived Sept. 18, 2016) ("IMO has served global society well. As its record to date so clearly demonstrates, it should be entrusted to continue that work when it comes to addressing greenhouse gas emissions from shipping."); *see also IMO Only Place for Global Debate on Shipping and Climate Change, Says IMO Secretary General*, HELLENIC SHIPPING NEWS WORLDWIDE (Sept. 29, 2015), http://www.hellenicshippingnews.com/imo-only-place-for-global-debate-on-shipping-and-climate-change-says-imo-secretary-general/ [https://perma.cc/M894-S7NW] (archived Sept. 18, 2016).

15. Ali Qassim, *Environmental Groups: Include Shipping in Paris Climate Talks*, 38 Int'l Env't Rep. (BNA) 1343 (Oct. 7, 2015).

16. Stephen Gardner, *EU Consultation Marks Start of Process To Regulate Carbon Emissions From Shipping*, 35 Int'l Env't Rep. 95 (BNA) (Feb. 1, 2012).

17. MICHAEL P. VANDENBERGH & JONATHAN M. GILLIGAN, BEYOND GRIDLOCK: CLOSING THE PARIS GAP (forthcoming 2016) [hereinafter CLOSING THE PARIS GAP].

instruments, the Paris Agreement, does not do enough.[18] Several of the binding instruments in international law that address this issue have a global scope: MARPOL, the London Convention, the Convention on the Law of the Sea (UNCLOS), and the Kyoto Protocol, among others. In addition to these large-scale environmental treaties, regional agreements also play a role in shipping's governance.[19] Factors outside the arena of hard law have a significant impact on carbon emissions in the shipping sector as well. For example, rate structures can play a role in setting incentives in a way that helps or hinders efforts to promote efficiency.[20]

The existing scholarship on improving efficiency in shipping has demonstrated the technical viability of these efficiency measures.[21] Literature on shipping has described the most important barriers preventing more widespread adoption of these measures, [22] but solutions to these problems have not been forthcoming.[23] Previous literature on private environmental governance has highlighted the role that it can play in complementing regimes of traditional regulation.[24] Private governance instruments have been applied to concrete environmental goals, both explicitly referencing the existing

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18. *Id.*

19. *See generally* Marie-Claire Cordonier Segger, *Sustainable Development in the Negotiation of the FTAA*, 27 FORDHAM INT'L L.J. 1118, 1147 (2003) ("The establishment of the Central American Integration System (Tegucigalpa Protocol) in 1991 has led to the relatively rapid negotiation and adoption of multiple regional environmental agreements, covering, among other areas, biodiversity and protected areas, hazardous-waste movement, forest conservation, and climate change.").

20. *See* Michael P. Vandenbergh & Jonathan A. Gilligan, *Beyond Gridlock*, 40 COLUM. J. ENVTL. L. 217, 223 (2015) [hereinafter *Beyond Gridlock*] ("The standard practice is to allocate most shipping fuel costs to the customer, not the shipping company, leaving the party that has the most control over fuel use with limited incentives to invest in efficiency.").

21. *See infra* Section II.B.

22. *See infra* Section III.A.

23. *See, e.g.*, HEISMAN & TOMKINS, *supra* note 5, at 21 (discussing reasons why shipping efficiency measures have not been adopted to the fullest possible extent); Eva Lema & Dimitris Papaioanou, *Policy Instruments and Recent Advances of the Greenhouse Gas Regulating Framework in Shipping*, 14 INTERDISC. ENVTL. REV. 238, 250 (2013) ("[C]ost effective operational and technical emission reduction measures are available to the shipping sector, although there might be some barriers in the uptake of many of these measures.").

24. *See* Michael P. Vandenbergh, *Private Environmental Governance*, 99 CORNELL L. REV. 129, 133 (2013) [hereinafter Vandenbergh, *Private Governance*] ("Private-private interactions now generate many of the environmental requirements that affect corporate and household behavior . . . ."); *see generally* Sarah E. Light & Michael P. Vandenbergh, *Private Environmental Governance, in* DECISION MAKING IN ENVIRONMENTAL LAW (Lee Paddock & Robert Glicksman eds., forthcoming 2016) (reviewing the existing legal scholarship on the role of private environmental governance and its applications to specific environmental goals).

body of legal scholarship[25] and acknowledging the need for private forms of regulation in novel areas.[26] Shipping is an unusually apt example of an area that is well suited to a private governance solution because it is difficult for governments to regulate, and ship owners face strong incentives not to operate in the most efficient way possible.[27] To date, legal scholarship has not focused explicitly on the relationship between private environmental governance as a coherent set of alternative regulatory concepts and the shipping industry, leaving a gap that this Note aims to fill.[28]

This Note argues that private governance instruments can fill the need of shipping more efficiently, thereby reducing the industry's emissions of greenhouse gasses. Part II of this Note describes the background of this issue, first by considering the current carbon impacts from maritime shipping, and second by characterizing the impact that these emissions have on climate change. Part II then discusses the public governance mechanisms currently in place that aim to regulate shipping's carbon emissions. Part III analyzes the reasons why increasing shipping efficiency is so difficult by discussing the governance deficits that have made this area challenging. Finally, Part IV proposes replacing traditional forms of regulation with private governance systems, building on two key assumptions: (1) excess carbon emissions are driven in part by market failures that can be addressed with incentive-shifting solutions,[29] and (2) it is impertinent to tether future environmental governance to new binding treaties both because those agreements are unlikely to occur[30] and because the

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25. *See* Kyle W. Robisch, *Getting to the (Non)Point: Private Governance as a Solution to Nonpoint Source Pollution*, 67 VAND. L. REV. 539, 568 (2014) (arguing that private governance holds "significant promise" for addressing the issue of pollution from nonpoint sources).

26. *See* Roy A. Partain, *Public and Private Regulations for the Governance of the Risks of Offshore Methane Hydrates*, 17 VT. J. ENVTL. L. 87, 135–36 (2015) (suggesting that private regulations can both "improve standard setting" and increase the "benefits of public regulation" in the context of exploitation of methane hydrates).

27. *See infra* Section III.A.

28. *But see* Scott, et al., *The Promise and Limits of Private Standards to Reduce Greenhouse Gas Emissions from Shipping*, 27 J. ENVTL. L. (forthcoming 2017). Scott et. al will discuss the same greenhouse gas-reducing standards as this Note, but their discussion is not tied to the broader context of private environmental governance. In contrast to Scott et al., who only examine private standards in the context of shipping, this Note describes private environmental governance as a set of actions that exists independently of their application to shipping, and argues that those actions and instruments are particularly well-suited to reducing shipping emissions.

29. *See Beyond Gridlock*, *supra* note 20, at 261 ("[E]xisting technologies and operational measures could cut emissions by up to thirty percent by addressing market failures such as suboptimal information, split incentives, and lack of capital for retrofitting.").

30. *See* Michael B. Gerrard, *Trends in the Supply and Demand for Environmental Lawyers*, 25 COLUM. J. ENVTL. L. 1, 1–2 (2000) (noting that "the field [of environmental law] has fallen into something of a funk.").

existing instruments still have more to offer.[31] Ultimately, this Note argues that the application of well-designed private governance tools can dramatically reduce the carbon emissions of maritime shipping—thereby displacing or at least complementing national or international legislative activity.

II. BACKGROUND

A. *Shipping's Contribution to Greenhouse Gas Emissions*

International shipping is fundamental to the global economy: 80–90 percent of all internationally traded goods are shipped from one place to another.[32] As discussed here, international shipping only refers to shipping between ports of different nations. Many of the same vessels engage in domestic and international shipping, but because the factors contributing to the difficulty in reducing their emissions arise from their international activity; domestic shipping is not an explicit focus of this Note. Nevertheless, because many of the same ships are engaged in both domestic and international shipping, carbon reducing strategies that rely on changes in ship technology would cause reductions in domestic shipping emissions as well. Because they present a distinct set of issues, military and fishing vessels are not included in this discussion, consistent with the IMO's practice.[33]

The impact of international shipping on the environment and human health is significant. In its third report on the greenhouse gas emissions from ships, the IMO found that carbon dioxide emissions from shipping averaged 1,015 million tons.[34] Although this figure is large, industry publications cite it as a low figure because it represents only 2.2 percent of global carbon dioxide emissions.[35] The extent to which shipping is already an efficient industry complicates attempts to reduce its emissions. Total emissions from the shipping industry are a small part of all greenhouse gasses being emitted from human-made sources.[36] But the global scale of the climate can make any individual

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31. *See, e.g.*, Michel A. Becker, *Russia and the Artic: Opportunities for Engagement Within the Existing Legal Framework* 25 AM. U. INT'L L. REV. 225, 227 (2010) ("[T]he Arctic poses many challenges, but it is not a twenty-first century incarnation of the Wild West. There are institutions and legal frameworks in place through which the challenges of Arctic governance and management can and should be addressed.").

32. HEISMAN & TOMKINS, *supra* note 5, at 3.

33. *See* THIRD GHG STUDY, *supra* note 3, at xv (defining 'International Shipping' as "shipping between ports of different countries, as opposed to domestic shipping. International shipping [in the IMO's GHG reduction study] excludes military and fishing vessels.").

34. *See id.* at 1.

35. *ICS*, *supra* note 1.

36. *See* Kevin M. Stack & Michael P. Vandenbergh, *The One Percent Problem*, 111 COLUM. L. REV. 1385, 1388 (2011) (calling problems of this kind "one percent problems,"

industry or nation look like a small contributor.[37] Climate change is a problem on an immense scale, but it exists as a result of the aggregation of numerous individually-small sources of emissions. Ignoring small contributors would preclude almost any effective solution.[38]

Further, carbon dioxide is only one part of shipping's environmental impact. The industry's emissions constitute approximately 15 percent of global nitrous oxides, and approximately 13 percent of sulfur oxides.[39] Although some of the shipping that the IMO studied is domestic, the majority of the emissions are the product of international shipping.[40] With atmospheric carbon dioxide crossing the 400ppm threshold in 2016, any opportunity for reduction is significant.[41]

B. *Technical Capacity to Reduce Emissions*

Because shipping's impact has been well-quantified, efficiency measures have been tested and shown to be effective.[42] The IMO's most recent greenhouse gas study forecasts that under business-as-usual conditions, maritime carbon dioxide emissions will increase by 50 to 250 percent in the period leading up to 2050.[43] Outside of the business-as-usual scenario, using these new technologies and practices could significantly mitigate the impact of shipping. Even though shipping is

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where a small contributor to a problem appears insignificant relative to the whole, but small contributors are so much of the problem that there can be no solution without them).

37. *Id.* ("[T]he size of the denominator—all activities that produce greenhouse gases (GHGs), viewed globally—is staggering, and this framing makes almost any source of emissions . . . [a] candidate[] for one percent arguments.").

38. *Id.* ("When all or many of the contributors are relatively small ones, however, the aggregation of one percent arguments leaves the problem without a solution.").

39. THIRD GHG STUDY, *supra* note 3, at 2.

40. *See id.* at 1 (tabulating data on total shipping and international shipping separately, where the differences are measurable but not substantial—as an example, total shipping CO2 equivalents emissions averaged 2.8 percent of world totals 2007–12, the international portion of that figure made up 2.4 percent).

41. *See* Brian Kahn, *The world passes 400ppm carbon dioxide threshold. Permanently*, GUARDIAN (Sept. 28, 2016), https://www.theguardian.com/environment/2016/sep/28/the-world-passes-400ppm-carbon-dioxide-threshold-permanently [https://perma.cc/WV6Y-3P75] (archived Oct. 23, 2016) ("[W]e're living in a 400 ppm world. Even if the world stopped emitting carbon dioxide tomorrow, what has already put in the atmosphere will linger for many decades to come.").

42. *See* Timothy J. Nast, *The Response of the International Shipping Industry to Global Climate Change*, 44 J. MAR. L. & COM. 29, 31 (2013) ("Industry insiders have identified significant potential for reducing GHG emissions through technical and operational measures.").

43. THIRD GHG STUDY, *supra* note 3, at 4.

already recognized as being a highly efficient mode of transport,[44] the Carbon War Room[45] estimates that "[t]hrough efficiency measures . . . shipping can reduce fuel consumption by between 30 and 60 percent, with the large variance due to differences in models, ages of ships and technological uncertainty."[46] In light of the huge scale of global shipping, this reduction would prevent the emission of approximately one billion tons of carbon dioxide.[47]

A recent International Council on Clean Transportation (ICCT) report noted that "industry-leading ships are about twice as efficient as industry laggards across major ship types, due to new ships' technical efficiency improvements, operational speed practices, and ship size differences."[48] Both designed efficiency in new ships and operational measures can have significant impacts on the total greenhouse gas emissions, and both could form parts of an overall fleet efficiency scheme.[49]

Designed efficiency in new ships is already having a significant impact on reducing emissions: MARPOL's mandated EEDI for new ships ensures that all newly built ships perform better than older ones.[50] As a result of these improvements, newer ships have consistently lower carbon intensity than older ships.[51] The ICCT demonstrated that ships fifteen years old or older have a carbon dioxide intensity 23 percent *greater* than industry average, whereas 2011 ships had a 28 percent *lower* carbon intensity.[52] The largest efficiency

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44. *See* Nast, *supra* note 42, at 30 ("[S]hipping is already by far the most carbon efficient mode of commercial transportation.").

45. *See Mission & Vision,* CARBON WAR ROOM http://carbonwarroom.com/what-we-do/mission-and-vision (last visited Sept. 16, 2016) [https://perma.cc/5E7B-FR5F] (archived Sept. 7, 2016) (describing the Carbon War Room as a non-profit, founded with support from Virgin Galactic's founder Richard Branson, whose mission is to "accelearate[] the adoption of business solutions that reduce carbon emissions at gigaton scale and advance the low-carbon economy.").

46. HEISMAN & TOMKINS, *supra* note 5, at 3–4.

47. *See id.* at 4 (projecting one billion tons of CO2 savings under a 60 percent efficiency scenario).

48. HAIFENG WANG & NIC LUTSEY, INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION, LONG-TERM POTENTIAL FOR INCREASED SHIPPING EFFICIENCY THROUGH THE ADOPTION OF INDUSTRY-LEADING PRACTICES 1 (2013), http://www.theicct.org/sites/default/files/publications/ICCT_ShipEfficiency_20130723.pdf (last visited Sept. 8, 2016) [https://perma.cc/MJ8R-87L3] (archived Sept. 8, 2016).

49. *See id.* at 9 (displaying a chart which lists operational efficiency measures as an important method of reducing fuel consumption).

50. EASON, *supra* note 6, at 26 ("[T]he fact is that all newbuildings are eco-ships. They all have increased performance, and it appears that they can easily meet mandatory performance design requirements."); *see also infra* Subsection II.C.3 (analyzing the efficiency requirements imposed on new ships under MARPOL regulations).

51. *See* WANG & LUTSEY, *supra* note 48, at 16 (stating that 2011 ships, on average, emit 28 percent less carbon dioxide than industry average containerships (7.5 years-old), and 72 percent less than fifteen year-old ships).

52. *Id.*

improvement is projected to occur as a result of design speed reduction.[53] The relationship between ship speed and fuel consumption is non-linear, so a ship that travels at a lower speed may emit much lower emissions than the same ship travelling faster. [54] This relationship can produce dramatic efficiency gains: for example, a recent study suggested that "for a containership a 10% engine load [still] means sailing at about half of the design speed."[55] Numerous other measures can be implemented in new ship construction that offer emissions reductions which, although small individually, amount to significant improvements in the aggregate. [56] Examples of other efficiency measures include propeller polishing, hull cleaning, waste heat recovery, and autopilot upgrades.[57]

In-use efficiencies are even more significant than designed efficiencies.[58] Because much of the existing fleet is older and not being replaced as rapidly as in-use efficiencies could be adopted, and because operational efficiency decreases emissions significantly more than design efficiency.[59] ICCT analyzed how design efficiency differs from operational efficiency and found that "operational in-use CO_2 emissions far exceed the design CO_2 emissions rates in each case."[60] Across ship types, operating at the maximum efficiency that the design allows would produce an average of 38 percent lower carbon dioxide emissions.[61]

A wide range of efficiency measures may be appropriate for existing vessels. These range from costly retrofits to simpler alterations in voyage planning that do not require any technical

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53. *See id.* at 9 (projecting a 10–30 percent potential CO_2 and fuel use reduction through the use of design speed reduction technology).

54. *See* Harilaos N. Psaraftis & Christos A. Kontovas, *Ship Speed Optimization: Concepts, Models and Combined Speed-Routing Scenarios*, 44 TRANSP. RES. PART C 52, (2014), http://www.sciencedirect.com/science/article/pii/S0968090X14000667 (last visited Sept. 8, 2016) [http://perma.cc/XVF4-YFAE] (archived Sept. 8, 2016) [hereinafter *Optimization*] (describing the trade-offs associated with a charterer's speed decision).

55. *Id.* at 53.

56. *See* WANG & LUTSEY, *supra* note 48, at 9 (tabulating the improvements that can be made, both in new design and in in-use efficiencies).

57. *See id.* (listing the efficiencies described in the text, among a list of others that totals twenty measures).

58. *See* Harilaos N. Psaraftis & Christos A. Kontovas, *Speed Models for Energy-Efficient Maritime Transportation: A Taxonomy and Survey*, 26 TRANSP. RES. PART C 331, 331–32 (2012), http://www.sciencedirect.com/science/article/pii/S0968090X12001246 [https://perma.cc/53EF-J7N7] (archived Sept. 8, 2016) [hereinafter *Models*] ("Simply stated, for a variety of reasons, economic and environmental, sailing fast may not necessarily be the best choice, and optimizing ship speed is receiving increased emphasis these days and is likely to do so in the years ahead.").

59. *See* WANG & LUTSEY, *supra* note 48, at 11 (pointing out that average operational efficiency currently falls short of design efficiency, indicating that there is room to improve efficiency through other measures).

60. *Id.*

61. *Id.* at 12.

changes to a vessel.[62] Some illustrative options at the high-cost end of the range include installation of wake-accelerating modifications that increase efficiency [63] and advanced hull coatings, [64] which show promise for vessels with a long operational life. Monitoring software, which is available from multiple sources, allows for accurate measurement and fine adjustments in efficiency and vessel operation.[65] Finally, wind technology can be adapted to modern needs and may be a viable option for decreasing a vessel's dependence on fossil fuels.[66] Although wind power may seem like an anachronistic suggestion, there are currently companies around the world developing new commercial applications of wind propulsion.[67]

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62. *See* Qiang Meng, et al., *Containership Routing and Scheduling in Liner Shipping: Overview and Future Research Directions*, 48 TRANSP. SCI. 265, 265–80 (2014) (reviewing and summarizing past studies on containership routing to explain a gap between academic work and industry practice); Shuaian Wang, et al., *Bunker Consumption Optimization Methods in Shipping: A Critical Review and Extensions*, 53 TRANSP. RES. PART E 49, 49–62 (2013) (generating "methods [that] could be used to optimize the sailing speed of ships, minimize emissions, and plan jointly for port operations and shipping operations.").

63. *See, e.g.*, *Becker Mewis Duct*, BECKER MARINE SYSTEMS, http://www.becker-marine-systems.com/03_products/products_mewis.html (last visited Mar. 3, 2016) [https://perma.cc/SFL2-2DRK] (archived Sept. 8, 2016) ("The average of fuel saved [by using this technology] is at 6%. This also means 6% less emissions of greenhouse gases.").

64. *See, e.g.*, *MSC Reaps Fuel Efficiency Gains with Jotun's Hull Performance Solutions*, JOTUN MARINE COATINGS (Feb. 19, 2015), http://www.jotun.com/de/en/b2b/news/MSC-vessels-with-Jotun-Hull-Performance-Solutions.aspx [https://perma.cc/QW5Z-9L9L] (archived Sept. 8, 2016) (quoting a customers' statement that Jotun's state-of-the-art hull coating SeaQuantum X200 "has shown to be an effective antifouling technology to lower fuel costs and associated carbon emissions . . .").

65. *See, e.g.*, EASON, *supra* note 6, at 19 ("[C]ompanies such as BMT Smart, Marorka, Eniram and Greensteam . . . all have software tools that can be used to monitor energy use, and thus fuel consumption, by using data from an array of sensors.").

66. *See* Marine Environment Protection Commission Resolution 213(63), MEPC 63/23, at 11 (Mar. 2, 2012) [hereinafter *SEEMP Resolution*] ("Even wind assisted propulsion may be worthy of consideration."); EASON, *supra* note 6, at 19–21 (discussing companies developing and marketing wind technologies to assist propulsion of commercial vessels); Nast, *supra* note 42, at 31 (noting the practical feasibility of renewable energy in the form of thrust generated by wind and the worthwhile byproducts of such technology).

67. *See, e.g.*, *Suction Wing Propeller*, CENTRE DE RECHERCHE POUR L'ARCHITECTURE ET L'INDUSTRIE NAUTIQUES, http://site.craintechnologies.com/index.php/en/wind-propulsion-en/suction-wing-en (last visited Mar. 3, 2016) [https://perma.cc/KF5T-KCY6] (archived Sept. 8, 2016) (suction wing technology); NORSEPOWER, http://www.norsepower.com/ (last visited Mar. 3, 2016) [https://perma.cc/2Q6J-4ZGK] (archived Sept. 8, 2016) (modernized Flettner rotors); *Skysails – die nächste Generation der Windkraft!*, SKYSAILS GMBH, http://www.skysails.info/ (last visited Mar. 3, 2016) [https://perma.cc/U7J4-2JPA] (archived Sept. 8, 2016) (sky sails); *see also* SILVERSTREAM TECHNOLOGIES, http://www.silverstream-tech.com/ (last visited Mar. 3, 2016) [https://perma.cc/T96T-VJXU] (archived Sept. 8, 2016) (air lubrication).

All of these technologies lessen a ship's greenhouse gas emissions by reducing fuel consumption, and in so doing also lower costs.[68] But the barriers that block their full adoption are significant:

> It is widely accepted that, the maritime sector should contribute to the global effort of mitigating GHG emissions. However, most parties in the IMO believe that the maritime transportation should not be treated like other industries under the Kyoto Protocol due to the complexity of this industry and its special role in world trade.[69]

This Note argues that overcoming these barriers is possible and that doing so will involve using these technologies' full potential without depending on formal legal intervention.

C. Existing Public Governance Structures

Inter-governmental bodies at the international level have attempted to address shipping's greenhouse gas emissions. This Part explores these traditional governmental responses, identifying UNCLOS, UNFCCC, MARPOL, and several principles of customary international law. Each of these UN organizations are forms of public governance, and each is limited in its capacity to fully address shipping emissions.

1. UNCLOS

UNCLOS is the primary UN instrument governing the sea generally. [70] Although the treaty is comprehensive and widely accepted, its tools for addressing climate change are weak. [71] Part twelve of UNCLOS prioritized the protection and preservation of oceans.[72] States are encouraged to cooperate in establishing rules and standards designed "to prevent, reduce and control pollution of the marine environment from any source, using for this purpose the best

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68. *See Optimization*, *supra* note 54, at 53 ("In addition to being important from an economics perspective, speed reduction can also have important environmental benefits, as emissions from ships are directly proportional to fuel burned. In that sense, speed reduction is one of the important operational or logistics-based measures to reduce emissions from ships.").

69. Lema & Papaioanou, *supra* note 23, at 243.

70. United Nations Convention on the Law of the Sea, Dec. 10, 1982, 1833 U.N.T.S. 397 [hereinafter UNCLOS].

71. *See* Marcus A. Orellana, *Climate Change and the International Law of the Sea: Mapping the Legal Issues*, *in* CLIMATE CHANGE IMPACTS ON OCEAN AND COASTAL LAW 262 (Randall S. Abate ed., 2015) ("[T]he application of general obligations to the climate change mitigation context must overcome formidable obstacles . . . evincing the weaknesses of the legal tools available in UNCLOS to address climate change.").

72. *See* UNCLOS, *supra* note 70, arts. 192–237 (providing—in Art. 192—the then-novel concept that "[s]tates have the obligation to protect and preserve the marine environment.").

practicable means at their disposal and in accordance with their capabilities."[73] UNCLOS' broad definition of pollution in the marine environment encompasses hazards to human health and impairment of the quality of sea water. This definition has left an open question concerning whether it may be possible to construe "pollution" to include greenhouse gas emissions.[74] Regardless of how this open question[75] is ultimately resolved, a claim under this general obligation would have to overcome substantial obstacles relating to proof of causation, the extent to which common but differentiated responsibilities provide a safe harbor, and more.[76]

UNCLOS' provisions for the passage of foreign ships through territorial seas similarly provide only a limited framework for addressing environmental goals. The Convention generally allows all ships a right of innocent passage through other states' territorial seas, but it qualifies that right with a requirement that those vessels' passage "is not prejudicial to the peace, good order or security of the coastal State."[77] Prejudicial is further qualified so that the right of innocent passage allows neither "any act of wilful [sic] and serious pollution contrary to this Convention,"[78] nor any passage "in violation of the principles of international law."[79] Coastal states are empowered to place limitations on innocent passage through their territorial seas that pertain to the preservation of that state's environment, but no state can unilaterally create restrictions on "design, construction, manning or equipment of foreign ships."[80]

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73. *Id.* at art. 194.

74. *Id.* at art. 1(4). *Cf.* Orellana, *supra* note 71, at 259 (pointing out that despite the broad language of the pollution definition, situating climate change emissions within its scope raises difficult issues).

75. *See* Orellana, *supra* note 71, at 259 ("Whether this general obligation is capable of effectively addressing climate change emissions remains an open question, however."); *see also Palau Seeks UN World Court Opinion on Damage Caused by Greenhouse Gases*, UN NEWS CENTRE (Sept. 22, 2011), http://www.un.org/apps/news/story.asp?NewsID=39710#.VkkkTPmrTIV [https://perma.cc/4YF5-KXCP] (archived Sept. 8, 2016) (announcing Palau's request that the ICJ issue an advisory opinion on whether countries have a responsibility to ensure that greenhouse gas emissions in their territory do not harm others).

76. *See* Orellana, *supra* note 71, at 259–62 (picking apart the challenges that would attach to proving a claim under this general obligation, if it is an obligation at all).

77. UNCLOS, *supra* note 70, at arts. 17, 19 (establishing right of innocent passage and clarifying that innocent passage is one that is not prejudicial, respectively).

78. *Id.* at art. 19(2)(h).

79. *Id.* at art. 19(2)(a).

80. *See id.* at arts. 21(1)(f), 21(2) (preventing unilateral action by one state by stipulating that no state can take measures restricting foreign vessels "unless they are [simply] giving effect to generally accepted international rules or standards").

2. UNFCCC

Parties to the United Nations Framework Convention on Climate Change (UNFCCC) are already signatories to that convention's ambitious goal of stabilizing emissions within a time frame that will "allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner."[81]

In 1997, the Kyoto Protocol to the convention directed states to "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." [82] Passing this responsibility to the IMO was motivated in part by the difficulties of applying emissions standards to so many different party nations,[83] but also acknowledged the older, more technically-expert IMO mission "[t]o provide 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 . . . ."[84]

Even with significant regulatory authority delegated to the IMO, the UNFCCC could have an impact on shipping emissions by setting goals, or designing and integrating clear targets into the complete picture of a global emissions reduction plan. Shipping was not the target of any new requirements. The Convention's failure to do so has already been termed a "conspicuous hole" in the Paris Agreement.[85]

The Paris Agreement codified nationally-determined emissions reduction targets determined by the party states.[86] Commenters have pointed out that there is a gap between what needs to happen for the Agreement to achieve the goals that it aspires to, and what would

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81. United Nations Framework Convention on Climate Change, May 9, 1992, S. TREATY DOC. No. 102-38, 1771 U.N.T.S. 107, art. 2 [hereinafter UNFCCC].

82. Kyoto Protocol to the United Nations Framework Convention on Climate Change, art. 2(2), Dec. 11, 1997, 2303 U.N.T.S. 148; U.N. Doc. FCCC/CP/1997/L.7/Add.1[hereinafter Kyoto Protocol].

83. *See* Nast, *supra* note 42, at 32 ("The Kyoto Protocol excludes emissions from shipping (marine bunker fuels), due to the global nature of shipping and the difficulty in assigning ship sourced emissions to economic activities of specific countries.").

84. Convention of the Intergovernmental Maritime Consultative Organization, art. 1, Mar. 6, 1948, 9 U.S.T. 621, 289 U.N.T.S. 48. The organization's name was later simplified to the International Maritime Organization as it is now known.

85. Benjamin Hulac, *Rules for Ship, Airplane Emissions Left Out of Paris Deal*, CLIMATEWIRE (Dec. 14, 2015), http://www.eenews.net/climatewire/2015/12/14/stories/1060029447 (subscription required) [https://perma.cc/CK6R-6GZ6] (archived Sept. 8, 2016).

86. Paris Agreement, art. 2(1)(a), Dec. 12, 2015, U.N. Doc. FCCC/CP/2015/L.9/Rev.1 [hereinafter Paris Agreement].

result if the only outcome of the agreement is compliance with the commitments already made:

> Although the Agreement takes a significant first step, without additional steps the world will fall far short of even the more modest goal [of keeping warming below 2°C]. This is the Paris Gap—the difference between the goals of the Paris Agreement and what it will actually achieve, even if all countries fully comply with their commitments.[87]

In theory, achieving greater reductions in emissions of greenhouse gases could have come about through intensified national commitments or reductions from areas not contemplated by the agreement, like shipping. Because the Paris Agreement did not address these areas, there is an ongoing need for measures that go beyond the commitments it contained. Although critics have decried the Paris Agreement's omission of shipping, [88] opportunities for reducing shipping emissions exist through other instruments. Given the relatively poor track record of international legal instruments in addressing climate change, venues other than treaty-making may be even more effective than inclusion in the Paris Agreement.

3. MARPOL

The primary international instrument directly regulating shipping is the International Convention for the Prevention of Pollution from Ships (MARPOL).[89] The IMO is the UN. agency that adopted MARPOL; it has "global standard-setting authority for the safety, security and environmental performance of international shipping."[90] In its original form MARPOL did not address air pollution

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87. CLOSING THE PARIS GAP, *supra* note 17.

88. Hulac, *supra* note 85, ("The final text from the Paris summit . . . following days of syntactical sanding, buffing, tweaking and negotiating, requires no action from the shipping and aviation industries . . . .").

89. International Convention for the Prevention of Pollution from Ships, Nov. 2 1973, 34 U.S.T. 3407, 1340 U.N.T.S. 184; *see also* Protocol of 1978 Relating to the International Convention for the Prevention of Pollution from Ships, Feb. 17 1978, 34 U.S.T. 3407, 1340 U.N.T.S. 61 (amending the original convention—these documents are collectively referred to as 'MARPOL 73/78' or simply 'MARPOL'). MARPOL restricts dumping waste at sea, but excludes wastes that are incidental to the normal operation of vessels. While the protocol thus cannot be used to regulate greenhouse gas emissions from ships, it tangentially relates by regulating how sub-sea carbon sequestration and ocean fertilization may be undertaken. *See* INTERNATIONAL MARITIME ORGANIZATION, CLIMATE CHANGE AND THE LONDON CONVENTION AND PROTOCOL (2011), http://www.imo.org/en/OurWork/Environment/LCLP/EmergingIssues/Documents/LCLP%20and%20climate%20change.pdf [https://perma.cc/EBA6V49D] (archived Sept. 8, 2016) (explaining that the London Convention and London Protocol apply to a "significant proportion of global shipping").

90. *Introduction to the IMO*, INT'L MAR. ORG., http://www.imo.org/en/About/Pages/Default.aspx (last visited Sept. 8, 2016), [https://perma.cc/QV8X-CV8G] (archived Sept. 8, 2016).

from ships, focusing instead on oil, harmful substances carried in bulk, harmful substances in packaged form, ship-generated sewage, and garbage.[91] In 1997, the IMO adopted Annex VI, which added air pollution to the class of pollution that MARPOL covers by setting limits on the emission of nitrous and sulfur oxides.[92] In that same year, the IMO produced its first study on greenhouse gas emissions from ships, concluding that using operational and technical measures reduces shipping's impact.[93]

In 2009, the IMO's Marine Environment Protection Committee (MEPC) approved a set of voluntary efficiency measures.[94] These included guidelines for an Energy Efficient Design Index for New Ships (EEDI), a Ship Energy Efficiency Management Plan (SEEMP), and an Energy Efficiency Operational Indicator (EEOI).[95] In 2011, the IMO adopted an amendment to Annex VI that included EEDI and SEEMP as legally binding regulations addressing designed efficiency and operational efficiency, respectively, based on the voluntary guidelines approved in 2009.[96]

Regulation 21 of MARPOL Annex VI sets out an EEDI formula that creates different levels of reduction for different categories of ships and sets progressive steps to create greater reductions over the course of the regulation's implementation.[97] Rather than prescribing a specific technology or design requirement, EEDI imposes a minimum efficiency standard per capacity mile.[98] In theory, this should allow ship builders to choose the most cost-efficient way to meet the standard.[99] The EEDI standard is expressed as percentage reduction from reference emissions values that are established for each of the

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91. Eric. V. Hull, *Missing the Boat on Protecting Human Health and the Environment: A Re-Evaluation of the EPA's Emissions Policy on Large Ocean-Going Vessels*, 81 TEMP. L. REV. 1035, 1051 (2008) ("As originally enacted, MARPOL consisted of five separate annexes [each] designed to combat a particular class of pollutants . . . [oil, harmful substances in bulk and packaged forms, sewage and garbage, and in] 1997, the IMO adopted Annex VI to deal with air pollution from ships.").

92. *See id.*

93. *See* MD SAIFUL KARIM, PREVENTION OF POLLUTION OF THE MARINE ENVIRONMENT FROM VESSELS: THE POTENTIAL AND LIMITS OF THE INTERNATIONAL MARITIME ORGANISATION 109 (2015) (cataloging the history of the IMO's studies on greenhouse gas emissions from ships).

94. *Id.*

95. *Id.*

96. *See* IMO, Mar. Envtl. Protection Comm. (MEPC), Res. 203(62), U.N. Doc. MEPC 62/24,/Add.1 (Jul. 15, 2011) [hereinafter *EEDI Resolution*] (requiring EEDI in regulation 21, and SEEMP in regulation 22).

97. *See id.* at 11 (presenting formula and step-by-step plans for different types of ships to achieve these efficiency standards).

98. *See id.* at 11–12 (creating efficiency standard while retaining flexibility for those obliged to meet it); *see also* KARIM, *supra* note 93, at 111–13 (providing an explanatory background on EEDI's technical aspects).

99. KARIM, *supra* note 93, at 112.

categories of ships that are covered by the standard.[100] Although the reference line values are unique to the different categories of ships described in the regulation, the EEDI reduction standard uniformly calls for a 30 percent reduction by 2025 and continuing reductions beyond that date.[101]

In general, EEDI applies to new ships or existing ships that have undergone conversions so extensive that they would be considered new ships.[102] However, there are a variety of exclusions from the standard that limit its scope to some extent. At the beginning of the first and second implementation phases, the status of technological advances is to be reviewed, and "if proven necessary, [the Administration may] amend the time periods, the EEDI reference line parameters for relevant ship types and reduction rates set out in this regulation."[103] The regulation only applies to ships over 400 gross tonnage, excludes ships that only navigate within the sovereign waters of their flag state, and—subject to a few limitations—can be waived for four years after the regulations came into force.[104]

SEEMP was the second mandatory efficiency measure that the IMO adopted. By making these provisions mandatory, the MEPC acknowledged that "[i]n global terms it should be recognized that operational efficiencies delivered by a large number of ship operators will make an invaluable contribution to reducing global carbon emissions."[105] Yet in contrast with EEDI, SEEMP does not create obligatory efficiency targets for ships or their operators.[106] Instead, its aim is to create a planning mechanism through which companies and operators may voluntarily undertake emissions reductions.[107]

The MEPC's guidelines direct a company to develop ship-specific SEEMPs in four steps: (1) planning, (2) implementation, (3) monitoring, and (4) self-evaluation and improvement.[108] The guidelines also include a catalogue of efficiency measures that can be included in the SEEMP, providing measures to be undertaken at various stages of the journey.[109] These range from voyage specific measures like improved voyage planning, speed optimization, and

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100. *See EEDI Resolution*, *supra* note 96, at 11.

101. *Id.* at 11–12.

102. *Id.* at 11.

103. *Id* at 12.

104. *Id.* at 9–10; KARIM, *supra* note 93, at 113.

105. *SEEMP Resolution*, *supra* note 66, at 3.

106. KARIM, *supra* note 93, at 111. ("Although SEEMP is mandatory, it does not impose a specific energy-efficiency target for ships or companies").

107. *See id.* ("The Convention obligates ship-owners to take into account the guidelines adopted by the IMO, but does not make it compulsory to follow those guidelines. This leaves a broad discretion to ship-owners to decide what measures to adopt for ensuring energy efficiency.").

108. *SEEMP Resolution*, *supra* note 66, at 4.

109. *Id.* at 7.

weather routing, to company-wide actions like optimum utilization of fleet capacity and integrating regular in-water hull maintenance assessments to minimize resistance.[110] Identifying and collecting this information does not require achieving efficiency gains, but having data is a crucial building block toward ultimately targeting a reduction.[111]

4. Customary International Environmental Law

Climate change is the quintessential transboundary harm, where the impacts of actors in one state can affect the rest of the world.[112] Customary international law dictates that despite the strong respect for national sovereignty, states have a responsibility to prevent transboundary harms from actions arising within their borders.[113] This principle—termed the prevention of transboundary harms—was expressed early in the history of international environmental law as Principle 21 of the Stockholm Declaration.[114] As adopted there, the principle indicates that "[s]tates have . . . the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction."[115] The *Trail Smelter* case is the classic example of a transboundary harm, but it highlights the key reason that this principle insufficiently addresses climate harms. There, the claim was between two governments willing to take responsibility for concrete, immediate harms and hoping to "reach a solution just to all parties concerned."[116] Relative to their sources, the consequences of

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110. *See id.* at 7–11 (detailing efficiency measures that could be undertaken as examples of what might be included in a SEEMP, with options ranging from the highly technical to strategic logistical choices about selecting trade and sailing areas for a ship).

111. Nast, *supra* note 42, at 34 ("A tangible means of gauging vessel efficiency is a crucial aspect of any successful solution to the climate change problem in the maritime sector.").

112. *See supra* Section II.A. (describing the impact of shipping's emissions on the global climate).

113. *See* Trail Smelter Arb. (U.S. v. Can.), 3 R.I.A.A.1905, 1962–63 (Perm. Ct. Arb. 1938 & 1941) [hereinafter *Trail Smelter*] (resolving U.S.-Canada damages claim arising from sulfur dioxide fumes that migrated across the border under the principle that a state may not allow actions in its borders to harm another state); INTERNATIONAL ENVIRONMENTAL LAW REPORTS: EARLY DECISIONS 476 (Cairo A. R. Robb ed., 1999) (describing the Swiss Federal Tribunal's Nov. 1900 resolution of a transboundary dispute concerning a shooting range: "in public international law . . . the exercise of one's own right should not prejudice the right of one's neighbor.").

114. Stockholm Declaration of the United Nations Conference on the Human Environment, Jun. 16, 1972, U.N. Doc. A/CONF.48/14/Rev.1.

115. *Id.*

116. *See Trail Smelter*, *supra* note 112, at 1912; *cf.* Catherine Tinker, *Responsibility for Biological Diversity Conservation Under International Law*, 28 VAND. J. TRANSNAT'L L. 777, 806 (1995) (noting that in terms of stare decisis, "the Trail Smelter arbitration [is] a decision with no precedential value in any judicial forum").

greenhouse gas emissions are remote in time and space. Even if the responsibility to prevent transboundary harms might dictate that certain states *should* be responsible to specific parties for climate harms, it would remain unclear what court could adjudicate that claim and even less clear whether a decision would be meaningful.[117]

Since the UNFCCC was negotiated at the 1992 Rio Convention, the principle of common but differentiated responsibilities has been prominent in international action on climate change.[118] In general terms, the principle recognizes that a problem like climate change is a common concern of all states, but that states' have different levels of responsibility both in terms of being causes of the problem and in what action will be taken to address it. The purpose that animates the use of the principle in this context is more nuanced:

> [T]he purposes of differentiation can be summarized as follows: (1) to assign a greater obligation to those who have contributed more to a particular environmental problem, e.g., climate change; (2) to assign a greater obligation to those who have more resources or capacity to deal with a particular situation, even if they did not cause that problem; (3) to recognize the special situation of one or more countries—and that does not necessarily have to be only developing countries, it can be other countries as well; (4) to recognize that countries may have different priorities and that a particular environmental issue may not be their top priority; and (5) to promote broad participation in an agreement. This is a practical approach. Even though it may be inappropriate or illogical to make a distinction between parties, it is done because more parties may then join the agreement and then we all will be better off.[119]

Despite the intuitive equitable appeal of including this principle in international climate agreements, it has not been effective.[120] Because national contributions of greenhouse gasses to total atmospheric stocks are decidedly unequal,[121] the principle of common

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117. *See generally* Jessica Gordon, *Inter-American Commission on Human Rights to Hold Hearing After Rejecting Inuit Climate Change Petition*, 7 SUSTAINABLE DEV. L. & POL'Y 55 (2007) (reporting on the Inter-American Commission on Human Rights' denial of an Inuit Circumpolar Council petition alleging that the United States' inaction on greenhouse gas emissions violated their human rights).

118. UNFCCC, *supra* note 81, at 1 ("Acknowledging that the global nature of climate change calls for the widest possible cooperation by all countries and their participation in an effective and appropriate international response, in accordance with their common but differentiated responsibilities . . . ."); *see also* Justin Lee, *Rooting the Concept of Common but Differentiated Responsibilities in Established Principles of International Environmental Law*, 17 VT. J. ENVTL. L. 27, 30 (2015) (explaining how common but differentiated responsibilities have appeared consistently in international instruments since the 1992 Rio Convention).

119. Susan Biniaz, et al., *Common but Differentiated Responsibility*, 96 AM. SOC'Y INT'L L. PROC. 358, 359 (2002).

120. *See id.* at 361 ("In my view the [common but differentiated responsibilities] principle is not necessary, and it is not helpful.").

121. KEVIN A. BAUMERT, ET AL., WORLD RESOURCES INSTITUTE, NAVIGATING THE NUMBERS: GREENHOUSE GAS DATA AND INTERNATIONAL CLIMATE POLICY 113 (2005)

but differentiated responsibilities has negatively affected the development of international responses to climate change. Motivated in part by this principle, the Kyoto Protocol only imposed binding commitments on developed countries, leaving out the developing economies that have since become significant contributors to greenhouse gas emissions.[122] This separation led the United States to decline to ratify the protocol, and continued to block implementation of international instruments on climate regulation. [123] The Paris Agreement shifts the dialogue away from differentiated responsibilities, but leaves room for the concept to operate by allowing parties to individually determine what their contributions will be.[124] Drawing on the principle of differentiated responsibilities, parties that were considered developing at the time of the Kyoto Protocol are still able to proffer diluted goals relative to other states if they decide that their responsibilities are not equal to larger contributors.

III. ANALYSIS

A. *Reasons for the Problem: Public Governance Deficits and Market Failures*

Despite the range of options available to allow shipping to maintain its place in the world economy while emitting less carbon, significant barriers stand in the way. At its core, the problem of inefficiencies in shipping is a collective action problem: the atmosphere is a common pool into which individual shippers can pollute with impunity. When this occurs, the value of the whole pool is reduced. In effect, this imposes a cost on all other participants in this system. If one participant elects not to contribute to polluting the atmosphere, he

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(tabulating total national contributions to atmospheric CO_2 stocks during the period from 1850–2002).

122. Kyoto Protocol, *supra* note 82, art. 3 ("The Parties included in Annex I [only] shall . . . ensure that their aggregate anthropogenic carbon dioxide equivalent emissions . . . do not exceed their assigned amounts . . . .").

123. *See* S. Res. 98, 105th Cong. (1998) (enacted) ("[T]he United States should not be a signatory to any protocol [which would] mandate new commitments to limit or reduce greenhouse gas emissions for the Annex I Parties, unless the protocol or other agreement also mandates new specific scheduled commitments to limit or reduce greenhouse gas emissions for Developing Country Parties within the same compliance period."); Lee, *supra* note 118, at 34 (describing the Congress' decision not to ratify the Kyoto Protocol and how subsequent UNFCCC actions have beneficially eroded the notion that developing countries need not act on climate).

124. *See* Paris Agreement, *supra* note 86, at 1 ("Acknowledging that climate change is a common concern of humankind, Parties *should*, when taking action to address climate change, respect, promote and consider their respective obligations on human rights, the right to health, the rights of indigenous peoples, local communities, migrants, children, persons with disabilities and people in vulnerable situations . . . .") (emphasis added).

or she bears the full cost of finding a non-emitting way to ship, but her share of the value of the common pool is still reduced by all other participants' use. As a result, any individual ship owner has a disincentive to be the lone efficient operator.

This Part analyzes the shortcomings of public governance that are significant obstacles to overcoming these problems, and goes on to describe the market failures that further undermine participants' motives and ability to change this regime.

1. Flags of Convenience

One of the most important factors making collective action on shipping's emissions challenging is the widespread use of flags of convenience. In other words, the owners can choose which nationality their vessel will bear. "In general terms, it can be said that a vessel flies a flag of convenience when it has no real economic connection (or no 'genuine economic link') with the country whose flag it flies."[125] A state is said to have an "open registry" when it accepts vessels on its shipping register with which it has no genuine economic link.[126] While estimates are imprecise and varied, as much as half of the world's fleet flies flags of convenience.[127] Registering under a flag of convenience can benefit ship owners seeking to avoid the cost of regulation: evading taxes, skirting government regulation, concealing the owner's identity, and in some cases escaping law enforcement's reach.[128] Despite the potential for facilitating evasion of regulations, the principle reason why companies register flags of convenience is to reduce costs.[129]

The costs of registering a ship in a nation with robust requirements is significant. As an example, when the U.S. Government Accountability Office analyzed the impacts of a rule that would require U.S. liquefied natural gas (LNG) exports to be made using only U.S. built and flagged vessels, the costs were found to be significantly higher than those associated with a foreign flagged fleet.[130] The U.S.

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125. Awni Benham, *Ending Flag State Control?, in* INTERNATIONAL MARINE ENVIRONMENTAL LAW: INSTITUTIONS, IMPLEMENTATIONS AND INNOVATIONS 123, 126 (Andree Kirchner ed., 2003).

126. *Id.* at 127.

127. *Id.* at 125; *see also* U.S. GOV'T ACCOUNTABILITY OFF., GAO-16-104, MARITIME TRANSPORTATION: IMPLICATIONS OF USING U.S. LIQUEFIED-NATURAL-GAS CARRIERS FOR EXPORTS 18 (2015) [hereinafter *GAO Report*] ("All currently operating LNG carriers are foreign-flagged . . . and, according to mariner unions we spoke with, employ few U.S. officers and no unlicensed U.S. mariners.").

128. Benham, *supra* note 125, at 127.

129. *See id.*, at 127 ("The reasons why these [reputable transnational] companies choose flags of convenience relate principally to crew costs.").

130. *GAO Report*, *supra* note 127, at 23 (concluding that the cost impacts of using U.S. built and flagged vessels for LNG exports would "increase the cost of transporting

built and flagged requirement could, GAO concluded, "be associated with about 24 percent higher shipping rates if all of the additional cost were passed on to the buyer." [131] Scholars concerned with environmental protection, mariners' safety, and the governance impacts of flags of convenience have noted the "amazing loophole in international law" that flags of convenience represent, yet their widespread use continues.[132]

Under UNCLOS Articles 90–94, flag states have some obligation to exercise jurisdiction and control over ships on their registry. Article 90 provides that every state—including land-locked states—can register ships.[133] Article 91 ostensibly narrows the scope of national registration by requiring that "[t]here must exist a genuine link between the State and the ship."[134] Despite the apparent limitation created by Article 91, the factors that are used to determine whether a genuine link exists set a low bar for showing the connection.[135]

Despite these ostensible obligations, whether flag states are able to exercise control in fact depends significantly on their ability to take enforcement actions against vessels that violate domestic laws. Open registry states are only able to take action against the nominal owner listed on their registry, meaning their most substantial enforcement action would be to de-register a ship.[136] This leaves little accountability for a vessel's true owner to remedy safety or environmental hazards created and only imposes the cost of re-registering in a different

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LNG from the Unites States, which would decrease the competitiveness of U.S. LNG as compared to other sources.").

131. *Id.* at 26.

132. *See* Benham, *supra* note 125, at 124 (discussing the problem of flags of convenience generally and noting also that this loophole has "contributed to the current global deficit in governance of the oceans."); *see also* Anastasia Telesetsky, *Scuttling Iuu Fishing and Rewarding Sustainable Fishing: Enhancing the Effectiveness of the Port State Measures Agreement with Trade-Related Measures*, 38 SEATTLE U. L. REV. 1237, 1248 (2015) (highlighting a move to implicitly recognize that flags of convenience "are part of the problem" of illegal, unreported, and unregulated fishing); H. Edwin Anderson, III, *The Nationality of Ships and Flags of Convenience: Economics, Politics, and Alternatives*, 21 TUL. MAR. L.J. 139, 162–66 (1996) (separating the challenges raised by flags of convenience into environmental, safety, and labor categories). *Cf.* Stefan Kirchner, et al., *Coastal State Obligations in the Context of Refugees at Sea Under the European Convention on Human Rights*, 20 OCEAN & COASTAL L.J. 57, 68 (2015) ("While there are still some states which offer flags of convenience, enabling ship owners to operate ships at very low environmental and employment standards, the situation has been improved significantly in recent years as the shipping industry has undergone a process of professionalization and globalization.").

133. UNCLOS, *supra* note 70, art. 90.

134. *Id.* art. 91(1).

135. Factors that are relevant to finding a genuine link include the fleet's contribution to the national economy of the flag country, employment of nationals on vessels, and the beneficial ownership of the vessel. *See* Benham, *supra* note 125, at 126.

136. *Id.* at 127 ("Since these countries, unlike the normal registry owners, do not impose taxes, they do not have an incentive to identify the real owners . . . .").

state.[137] Port state action can have a localized impact,[138] but would do so at a significant cost[139] and would thus fail to create a genuine incentive for ship owners to employ energy efficient technologies.

International efforts to remedy this situation have been attempted, but have so far been ineffective. As an example, in 1986, an international instrument was negotiated to create new benchmarks for accountability in shipping—the United Nations Convention on Conditions for the Registration of Ships.[140] Article 5 of the Convention stipulated that a "flag state *shall* have a competent and adequate national maritime administration," and required that such an administration ensures that ships flying its state's flag comply with both the state's laws and regulations, and with "applicable international rules and standards concerning . . . the safety of ships and persons on board and the prevention of pollution of the marine environment."[141] The same Article went even further, requiring that flag states themselves require "all the appropriate information necessary for full identification and accountability concerning ships flying its flag."[142] These provisions would have bolstered the impact of other international agreements on marine pollution both by mandating that the flag state resolve the information deficits that make enforcement difficult and by obliging open registry states to ensure compliance with international instruments. Thirty years after it was negotiated, the Convention has still not come into force.[143] In some situations, governments can successfully regulate a common pool resource, facilitating collective action by enforcing penalties against resource users who do not join the action. [144] Here, however, the ability of ship owners to freely choose which flag to fly renders any one government incapable of organizing enough of the industry to

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137. *Id.* ("[N]ominal owners can circumvent deregistration by changing their company and ship name, and subsequently re-register.").

138. *See id.* ("A port State can take action against the crew of a vessel, but the owners are effectively outside its jurisdiction."). *But see* Michael Standert, *China Ports to Require Los-Sulfur Fuel for Oceangoing Vessels*, 239 Daily Env't Rep. (BNA) A-7 (Dec. 14, 2015).

139. *See, e.g.*, Jenny Mandel, *U.S. shipping requirement could derail industry – GAO,* ENERGYWIRE (Dec. 4, 2015), http://www.eenews.net/energywire/2015/12/04/stories/1060028968 [http://perma.cc/GA7Z-RZ6D] (archived Oct. 22, 2016) (arguing that requiring tankers who want to export U.S. LNG to only operate under U.S. Flags would be prohibitively costly).

140. United Nations Convention on Conditions for Registration of Ships, Feb. 7, 1986, U.N. Doc.TD/RS/CONF/23.

141. *Id.* art. 5(2), (3) (emphasis added).

142. *Id.* art. 5(4).

143. *Status of United Nations Convention on Conditions for Registration of Ships*, U.N. TREATY COLLECTION (last visited Oct. 8, 2016) https://treaties.un.org/pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XII-7&chapter=12&clang=_en [https://perma.cc/8CQG-5MDC] (archived Oct. 8, 2016).

144. *See infra* text accompanying notes 163–65.

overcome ship owners' disincentives to embrace efficiency. This highlights a state-level collective action problem which closely resembles the problem as encountered by individual ship owners: one state can elect to impose strict requirements on vessels flying its flag, but risks many of those ships de-registering and transferring to a more convenient flag state.

2. Principal-Agent Incentive Problem

Market failures are another factor responsible for limiting the adoption of energy-efficient technologies in shipping. These failures include principal-agent problems created by conflict of interest between a charterer [145] and a ship owner, externalities, and information deficits.[146] Each of these problems uniquely contributes an obstacle or creates a disincentive for an individual participant in the global climate system to take action to prevent harms to it. These problems are characterized as market failures—rather than regulatory gaps—because this Note argues that market solutions are viable options to moving past them.

The first of these market failures, the principal-agent problem, is comparable to the same problem in real estate: a landlord lacks the incentive to invest in energy-efficient technologies when it is the tenant who pays the utility bills.[147] The problem in shipping is that the charterer paying for his or her goods to be shipped usually pays the fuel costs for the voyage. Although the charterer may prefer to lower the fuel bill, the ship owner is indifferent.[148] Since ship owners can pass the costs of inefficient vessels through to the customer, they lack an incentive to invest their own capital in efficiency.[149] In addition, demands for quick service counsel ship owners toward inefficient voyage planning. The MEPC recognized this problem when it was producing its voluntary efficiency standards, but has not directly

145. The charterer refers to the customer who hires a ship to transport her goods from one place to another.

146. EASON, *supra* note 6, at 21. These categories are taken from the CWR Report, which includes lack of financing as a fourth category. Since the focus of this Note is on the relationship between private motivation and behavior change in the context of reducing GHG emissions, addressing the implementation challenges that environmentally friendly financing reforms would need to overcome is beyond its scope.

147. *See, e.g.*, HEISMAN & TOMKINS, supra note 5, at 21. ("This is a familiar incentive problem, also seen in the commercial real estate sector where building owners' [sic] are not incentivized to invest in energy efficient upgrades that would ultimately save their tenants money on utility bills.").

148. *See id.* at 23.

149. *Id.* at 21.

addressed it.[150] The committee instead suggested generally that "[e]fforts should be made when agreeing charter party terms to encourage the ship to operate at optimum speed in order to maximize energy efficiency."[151]

By splitting control of the ships efficiency from the cost of fuel, each party has less power to affect an efficient voyage. The ship owner is the party in the best position to make changes to a ship, and the only party that can directly control operational decisions affecting efficiency. If the ship's owner does not bear the cost of fuel, however, she has little incentive to take any steps to reduce that cost. The charter likely wants to reduce the costs of fuel as much as possible for a particular voyage, but ultimately lacks control over the ship. Even though the charterer may be able to bargain for more efficient practices and agree to bear the cost—and this Note argues that this power is significant—the cost of obtaining enough information about what efficiencies are available may prevent the use of this power.

The second of these market failures is the failure to price environmental services being depleted by those emitting greenhouse gasses. The shipping industry is currently able to externalize the environmental and human health impacts of its emissions. Shipping inefficiency is a collective action problem, where the common pool resource is the atmosphere as a sink for greenhouse gases.[152] Garrett Hardin famously described a problem of this kind as a tragedy of the commons.[153] Each individual has an incentive to exploit more than an equal share because the incremental benefit of using more of the resource is kept to his or herself, while the reduction in the total value of the resource is distributed amongst all of the resources' users. For shipping, this problem appears where, in the absence of an enforced carbon price, the climate consequences of shipping's greenhouse gas emissions are not attributable to ship owners. It costs nothing to emit greenhouse gasses, so if there is profit to be made by operating in a way that increases emissions, there is no economic disincentive from operating in that way.

Hardin's work has been criticized as an oversimplification by scholars who point out that there are examples of common pool

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150. *See SEEMP Resolution*, *supra* note 66, at 8 ("It is recognized that under many charter parties the speed of the vessel is determined by the charterer and not the operator.").

151. *Id.*

152. *See* Robert N. Stavins, *The Problem of the Commons: Still Unsettled after 100 Years*, 101 AM. ECON R. 81, 98 (2011) ("Climate change is a commons problem of unparalleled magnitude . . . for any individual political jurisdiction, the direct benefits of taking action will inevitably be less than the costs, producing a free-rider problem . . . .").

153. *See* Garrett Hardin, *The Tragedy of the Commons*, 162 SCI. 1243, 1244–46 (1968).

resources that are sustainably managed.[154] Unlike the atmosphere as a whole, those resources that are sustainably managed without government are characteristically ones that can be cheaply monitored, used by communities with robust social networks that can easily exclude outside users, and where the users themselves support rule enforcement.[155] Ship owners exhibit few of these characteristics, suggesting that it is unlikely that the resource-users autonomously govern greenhouse gas emissions in a sustainable way.[156]

Information deficits—the third of these market failures—limit the ability of charterers to understand what operational improvements in efficiency are available and which ships are inherently more fuel efficient.[157] The IMO's greenhouse gas emissions studies provide significant information on emissions, but fall short of providing a charterer with all the information that could be used to make a decision on what efficiencies might be used.[158] Although there are attempts to address this, the existence of the IMO studies serves to confirm the significance of the information deficit.[159]

B. *Proposals that Are Already in Place*

Despite being relatively well-understood, the problems that have prevented greater efficiency in shipping have not engendered effective solutions.[160] Many of these solutions recognize the fundamental collective action problem that shipping efficiency presents, but most suggestions still depend on a government or governments to implement and enforce some kind of regime—command-and-control regulation,

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154. *See* Thomas Dietz, Elinor Ostrom, and Paul C. Stern, *The Struggle to Govern the Commons*, 302 SCI. 1907, 1907 (2003) (suggesting that Hardin erred both by assuming that governmental institutions were the only way to sustain common pool resources, and that users were trapped in the system without the ability to create solutions).

155. *Id.* at 1908.

156. *But see* Vandenbergh, *Private Governance*, *supra* note 24, at 168 ("[A]lthough the global nature of some problems may vastly increase the number of parties at both ends . . . [f]or some goods, a small group of large corporate producers exists, as does a small group of global advocacy groups.").

157. HEISMAN & TOMKINS, *supra* note 5, at 21.

158. *See id.* at 25 ("Missing from the [IMO's] report is an assessment of how to effectively address the existing barriers to change to fully realize the technological gains available to the industry.").

159. *See infra* Subsection IV.B.1 (describing the existing certification efforts in the context of shipping emissions); *see also* Tracey M. Roberts, *The Rise of Rule Four Institutions: Voluntary Standards, Certification and Labeling Systems*, 40 ECOLOGY L.Q. 107, 153 (2013) ("Voluntary standards, certification and labeling systems identify and make visible the social, environmental and health impacts of resource extraction, harvesting and manufacturing in global trade.").

160. *See, e.g.*, Alice Bows-Larkin, *All Adrift: Aviation, Shipping, and Climate Change Policy*, 15 CLIMATE POL'Y 681, 693 (2015) (aggregating information on carbon reduction pathways for both aviation and shipping).

licensing, or creating tradeable rights. Cap-and-trade systems dominate the field of currently-proposed market-based solutions, and these proposals generally presume implementation by either the IMO or a new international agreement under UNFCCC or UNCLOS. Recognizing how difficult this may be, some of these solutions instead focus on port state controls on the ships that visit them. Finally, some proposals call for important states engaged in the industry to implement unilateral measures aimed at vessels themselves, rooted in national laws. Suggestions like these depend on political will to implement, and to whatever degree they are not self-enforcing, these suggestions may require state enforcement in order to be effective. As a result, they fail to overcome the substantial challenge of flags of convenience.

1. Greater Port State Controls on the Ships that Visit Them

Customary international law has largely accepted that a port state has some limited control over the ships that visit it.[161] And under UNCLOS Article 218, a port state is empowered to investigate a vessel "in respect of any discharge from that vessel outside the internal waters, territorial sea or exclusive economic zone of that State in violation of applicable international rules or standards . . . ."[162] Even where a vessel is navigating through a coastal state's waters without reaching a port, that state has, at least on paper, significant enforcement authority.[163] The effect of these provisions is that a port state has power to control which ships it admits. "If it imposes conditions on entry, and a foreign vessel enters without complying with those conditions, that vessel has violated the 'contract' and now being within the territory of the port state, can be punished for that violation."[164] Advocates of using port state jurisdiction to address marine pollution point out that "[i]nternational law is clear that the authority of the port state is superior to that of the flag state while the

161. *See* George C. Kasoulides, *Global and Regional Port State Regimes, in* COMPETEING NORMS IN THE LAW OF MARINE ENVIRONMENTAL PROTECTION 121, 121 (Henrik Ringbom ed., 1997) ("The *dicta* of customary international law prevailed that as a rule the port state does not have jurisdiction over vessels in its internal waters regarding polluting activities attributed to these vessels if these activities have no territorial link to the state concerned.").

162. UNCLOS, *supra* note 70, art. 218.

163. *See id.* At art. 220 ("Where there is clear objective evidence that a vessel navigating in the exclusive economic zone or the territorial sea of a State has . . . committed a violation . . . causing major damage or threat of major damage to the coastline or related interests of the coastal State . . . that State may . . . institute proceedings, including detention of the vessel, in accordance with its laws.").

164. Michael W. Reed, *Port and Coastal State Control of Atmospheric Pollution from Merchant Vessels*, 3 SAN DIEGO J. CLIMATE & ENERGY L. 205, 213 (2012).

vessel is in port."[165] The same advocates also note that "[a] port state's authority goes so far as to permit its insistence on certain design and construction standards."[166]

But despite these ostensible powers granted under UNCLOS, significant obstacles exist to using port state control in the context of greenhouse gas emissions. A state that wishes to be tough in prosecuting environmental violations in its exclusive economic zone risks running afoul of other domestic economic interests.[167] Even investigating aggressively in order to make information public, thereby eliciting more voluntary compliance, threatens costly delays that may be unacceptable.[168]

Although these obstacles have been overcome in other contexts, like dealing with invasive species and dumping,[169] they show the inadequacy of port state jurisdiction for reducing greenhouse gas emissions in sharp relief. The gap between what *can* be done to increase shipping's efficiency and what *is* being done has been created in part by the reticence of governments to use their authority to regulate in the climate context. Thus, even if a port state or group of states *could* impose restrictions that serve to reduce emissions, there is little evidence that they are willing or likely to do so. Professor Reed's assessment that the "Law of the Sea has achieved a workable balance between the interests of maritime States (freedom of navigation) and coastal States (environmental protection)"[170] is accurate with regard to politically neutral actions to reduce more traditional forms of marine pollution. Where it is incomplete however, is on the issue of greenhouse gasses.

2. Market-Based Mechanisms

Market based mechanisms (MBMs) are generally viewed as necessary for maximizing shipping efficiency.[171] These mechanisms

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165. Ted L. McDorman, *Regional Port State Control Agreements: Some Issues of International Law*, 5 OCEAN & COASTAL L.J. 207, 211 (2000).

166. Reed, *supra* note 164, at 214. While Professor Reed cites several examples, the extent to which this is actually feasible for the United States is unclear, and is far beyond the scope of this note. The United States is not a party to UNCLOS. *But see* Hull, *supra* note 91, at 1037 (arging that EPA has a non-discretionary duty to regulate emissions from ocean-going vessels).

167. Kasoulides, *supra* note 161, at 125.

168. *See id.* ("Immobilizing tankers at sea for purposes of boarding and inspection is a very complex and dangerous enterprise especially on certain routes used intensively for navigation.").

169. *See* Reed, *supra* note 164, at 225–26 (citing four examples of U.S. government placing limitations on certain pollution-related aspects of ships entering its waters).

170. *Id.* at 242.

171. *See, e.g.*, Lema & Papaioanou, *supra* note 23, at 242–43 (discussing deadlock in stakeholders' discussion of how to implement a market-based mechanism for

have been met with resistance by some stakeholders, but their potential effectiveness is widely accepted among countries in the IMO.[172] The reasons cited in favor of MBMs focus on the incentives they create for ship owners and the possibility of offsetting the growth in the industry while preserving shipping's role in world trade.[173] If successful, these measures would correct the problem of externalities by imposing real costs based on a ship's pollution. IMO experts have even concluded that MBMs could be the most cost efficient way to reduce shipping's emissions, and some have argued that they comport with customary international law by implicating the "polluter pays" principle by causing a ship owner to pay for her ship's emissions.[174]

The archetypical MBM is a cap-and-trade scheme, placing a limit on the total emissions that can be produced, and a scheme to trade allowances.[175] Theoretically, emitters have an incentive to reduce their emissions when the financial benefit of selling an allowance is greater than their cost in earning it.[176] Recognizing that measures like these could have a significant impact on shipping, the IMO's MEPC produced an expert group study in 2010 on MBMs for reducing greenhouse gas emissions from shipping.[177] The group's report analyzed proposals from states and industry groups that expressed wide variations on the basic structure.[178] The positions taken included: a cap-and-trade scheme managed by UNFCCC or IMO funded in part by a per-ton tax on fuel; a leveraged incentive system that would refund a fuel tax to ships meeting or exceeding efficiency benchmarks; port state levies referencing visiting ships' relative efficiency; a shipping-sector-wide cap on emissions with the possibility of purchasing out-of-sector offsets; and several more.[179]

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greenhouse gas emissions reductions from shipping, despite the the fact that parties agree that it is necessary).

172. *See id.* (discussing ship-owners' perception that MBMs would "cause managerial problems and bureaucracy, both onboard and ashore," but concluding that "the majority of countries in the IMO still believe that an MBM is necessary").

173. *Id.* at 243.

174. *Id.*

175. *See generally* Sarah E. Light, *The New Insider Trading: Environmental Markets Within the Firm*, 34 STAN. ENVTL. L.J. 3, 18–22 (2015) (discussing the theory and practice of cap-and-trade schemes).

176. *See id.* at 18 ("Emitters face financial incentives to reduce emissions when the price of reducing one marginal unit of emissions is less than the cost of an allowance and to purchase allowances from others when the price is less than their marginal cost of reducing emissions.").

177. Marine Environment Protection Commission, Reduction of GHG Emissions from Ships, MEPC 61/INF.2 (Aug. 13, 2010), http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/INF-2.pdf [https://perma.cc/4W3H-E3BW] (archived Aug. 31, 2016) [hereinafter IMO MBM STUDY].

178. *See id.* at 6–9 (providing an overview of the ten MBM proposals analyzed in the report).

179. *Id.*

The fundamental challenge of MBMs designed to address shipping emissions is in their implementation. The MEPC Expert Group was in agreement that the proposals they analyzed *could* be implemented, but did so with the caveat that "the time necessary [in order to do so] would be impacted by broader policy considerations."[180] And these experts disagreed about the role that the principle of common but differentiated responsibilities would play in implementing an MBM for shipping's emissions.[181] These proposals attempt to address the state-level collective action problem presented by flags of convenience by suggesting that a UN agency—the IMO—implement an MBM. But history suggests that this is not happening. In his own analysis of the proposals that MEPC considered however, Hariloas Psaraftis—a member of the IMO's Expert Group on greenhouse gasses—noted the steep political challenges to implementing an MBM: "[o]ne would hope that this difficult process would eventually find a way to move forward. Still, as things stand at this time, the path toward the ultimate selection of an MBM for international shipping seems to be tortuous and long."[182]

3. Regulating More Strictly Under National Laws

Some scholars have suggested that an avenue through which shipping's emissions might be reduced is through national laws of key players in the industry.[183] For example, Michael Hull has argued that the EPA has a nondiscretionary duty under § 213 of the Clean Air Act to regulate emissions from ocean-going vessels.[184] Hull argues, "the EPA should be required to promulgate meaningful emissions standards for [ocean-going vessel] engines consistent with the mandates of the CAA," but it is difficult to see how this mandate could get around the incentives and flags of convenience problems.[185]

And to the extent that this is a challenging interpretation of § 213, general principles of statutory interpretation will not bolster it. The *Charming Betsy* canon indicates that "an act of Congress ought never to be construed to violate the law of nations if any other possible construction remains."[186] There are examples of appellate courts in the

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180. *Id.* at 16.

181. *Id.*

182. Harilaos N. Psaraftis, *Market-Based Measures for Greenhouse Gas Emissions from Ships: A Review*, 11 WORLD MAR. U. J. OF MAR. AFF. 211, 231 (2012).

183. *See* Kevin Anderson & Alice Bows, *Executing a Scharnow Turn: Reconciling Shipping Emissions with international Commitments on Climate Change*, 3 CARBON MGMT. 615, 626 (2012) (arguing for "[v]ery stringent regulation or incentive mechanisms to deliver a wholesale shift to low-carbon shipping").

184. Hull, *supra* note 91, at 1060–61 (citing 42 U.S.C. §7547).

185. *Id.* at 1061.

186. Murray v. Schooner Charming Betsy, 6 U.S. 64, 118 (1804).

United States parsing international law in an effort to construe a U.S. statute consistently with it.[187] As a canon of statutory interpretation, however, *Charming Betsy* does not place a substantive limit on Congress' authority to abrogate international law, nor does it displace the presumption against extraterritorial application.[188] *Charming Betsy* would be poorly suited as a tool for drawing international norms into the interpretation of U.S. law; "[the *Charming Betsy* canon] only exerts a negative force on the meaning of statutes, pushing them away from meanings that would conflict with international law."[189]

This one example illustrates what can be expected from any unilateral national action aimed at reducing shipping's emissions or any other aspect of climate change.[190] No one country is in a position to alter the incentives of all the others, and it appears far-fetched that national laws protecting ship-owners, particularly in open registry states, could be abrogated in favor of international environmental laws. Even to the extent that one state *did* attempt to have an expansive impact on foreign vessels, its efforts would likely be vulnerable to challenge under international trade law.[191]

IV. A PRIVATE GOVERNANCE RESPONSE

Private governance can address the core collective action problem and the market failures described above, and can do so in a way that does not require governmental intervention. In view of the limited political feasibility of creating robust international regimes on shipping emissions and the flexibility of private solutions as conditions change, private solutions are particularly important. Private solutions

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187. *See, e.g.*, United States v. Ali, 718 F.3d 929, 936 (D.C. Cir. 2013) ("[B]ecause *Charming Betsy* counsels against interpreting federal statues to contravene international law, we must satisfy ourselves that prosecuting Ali for aiding and abetting piracy would be consistent with the law of nations.").

188. *See, e.g., id.* at 935 ("Neither [*Charming Betsy* nor the presumption against extraterritorial application] imposes a substantive limit on Congress's legislative authority, but they do constrain judicial inquiry into a statute's scope."). *See also* United States v. Ballestas, 795 F.3d 138, 144 (D.C. Cir. 2015) (quoting United States v. Yousef, 327 F.3d 56, 93 (2d Cir. 2003)) ("[I]f 'a statute makes plain Congress's intent,' a court 'must enforce the intent of Congress irrespective of whether the statute conforms to customary international law.'").

189. Al-Bihani v. Obama, 619 F.3d 1, 7 (D.C. Cir. 2010) (Brown, J., concurring).

190. *See* Vandenbergh, *Private Governance*, *supra* note 24, at 169–70 ("National governments have little ability to regulate environmental behavior in other countries, and the international trade regime makes it difficult to impose requirements on goods based on the characteristics of the process by which they are produced, as opposed to the characteristics of the finished good.").

191. *See generally* General Agreement on Tariffs and Trade, Oct. 30, 1947, 61 Stat. A-11, 55 U.N.T.S. 188 (prohibiting trade measures that violate antidiscrimination provisions of the treaty, unless those trade measures are aimed at protecting the environment and provided they are not implemented in a discriminatory way).

can play an important role in limiting emissions where regulations are absent and alongside formal legal structures which fail to succeed in protecting environmental quality.[192]

Scott, et al., argue that a hybrid of public and private governance can mitigate greenhouse gas emissions from shipping.[193] In contrast, this Part describes how the most notable unique power of private governance is its ability to operate effectively outside the limits of public governance. Alice Bows-Larkin, who noted that "a pragmatic approach would be to influence, incentivize, or set standards around technology and the operational options for shipping," alluded to this concept.[194] This Part expands on Bows-Larkin's idea, demonstrating how private environmental governance can address each of the problems identified in the preceding Parts without a need for political feasibility.

A. *Distinguishing Private and Public Environmental Governance*

The basic model of domestic environmental law as a collection of prescriptive legislative acts and regulations that enforce certain environmental behaviors through a state's police power fails to capture the full range of mechanisms through which environmental behavior is actually shaped. Comparably, a model of international environmental law that is confined to treaties, conventions, and the threat of sanctions misses the reality of private transnational instruments that impact global behavior relating to the environment. Instead of being confined to legislative or regulatory enactments, "[e]nvironmental preferences are expressed in purchasing, lending, investing, and supply chain contracting decisions . . . ."[195]

Private environmental governance refers to the set of actions "taken by non-governmental entities that are designed to achieve traditionally governmental ends such as managing the exploitation of common pool resources, increasing the provision of public goods, reducing environmental externalities, or more justly distributing environmental amenities."[196] Existing literature on private environmental governance demonstrates meaningful applications of these tools.[197] These measures serve to address the gap in governance

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192. *See* Vandenbergh & Gilligan, *Beyond Gridlock*, *supra* note 20, at 303 ("[P]rivate climate governance strategy . . . is not a substitute for a national and international carbon price, but it can generate significant emissions reductions until more complete responses become possible.").

193. *See* Scott, et al., *supra* note 28.

194. Bows-Larkin, *supra* note 160.

195. Vandenbergh, *Private Governance*, *supra* note 24, at 137.

196. *Id.* at 146.

197. *See, e.g.*, Amanda C. Leiter, *Fracking, Federalism, and Private Governance*, 39 HARV. ENVTL. L. REV. 107, 151 (2015) ("[P]rivate entities have already been quite

left by the absence of an international legal instrument addressing shipping emissions.[198]

B. *Shipping Efficiency Is Particularly Well-Suited to Private Governance*

Proposals that attempt to make shipping more efficient through creating stricter legal requirements for ships are blocked by collective action problems at an individual or state level. Individuals lack a motive to undertake efficiency measures that place them at a disadvantage relative to competitors, and individual nations similarly lack an incentive to send their ships overseas by creating uncommonly strict rules for their registry. Hybrid forms of governance must still work within the bounds of political feasibility to the extent that they require information or actions that only arise from public enforcement-motivated compliance. As a result, public–private hybrid regulatory schemes miss out on the unique opportunities to solve pernicious market failures; a private governance approach does not solve these problems, it bypasses them.

Private governance incorporates a broad range of instruments but excludes government-created carbon trading mechanisms.[199] Articulating every possible application of private environmental governance is beyond the scope of this Note,[200] but two applications of the concept that have a particularly clear relevance to carbon emissions from shipping merit close consideration: private standard-setting and supply chain contracting. These forms of governance are not unique to shipping, but have clear applications in this field.

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successful in collecting information on shale gas risks and in developing standards to address those risks."); Zdravka Tzankova, *Interactions Between Private and Public Resource Governance: Key Insights from the Fisheries Case*, 6 WM. & MARY POL'Y REV. 1, 25 (2014) ("The private regulatory initiatives of movement ENGOs [environmental non-governmental organizations] thus seem to be improving the potential for success in addressing some long-standing and change-resistant problems in the public management of public trust fishery resources.").

198. *See* Vandenbergh, *Private Governance*, *supra* note 24, at 161 (expressing that private governance is sometimes a response to a government's failure to act, citing the example of international law's difficulty with managing global commons).

199. *See id.* at 144 ("[A]lthough cap-and-trade has been a favored response to climate change, it requires government action such as the Waxman-Markey climate legislation, which would have created . . . [an] entitlement system for greenhouse gas emissions.").

200. For a rigorous discussion of the theory of private environmental governance see Vandenbergh, *Private Governance*, *supra* note 24, at 162–98.

1. Private Governance Solutions Obviate the Issues Raised by Flags of Convenience

Unilateral private standard-setting is the paradigmatic private environmental governance activity, led by examples like the Forestry Stewardship Council [201] and the Marine Stewardship Council (MSC). [202] Using the input of scientists, fisheries managers and industry representatives, the MSC developed a standard for sustainability in ocean fisheries. [203] Third-party auditors certify a fishery, which allows processors and retailers to use a recognizable MSC logo.[204] The process mitigates the impossibly high cost that an individual would face when attempting to single-handedly obtain all the information necessary to determine that a fishery is sustainable.[205] In contrast with a government standard, this private process avoids the potential for regulatory capture.[206] In addition, by creating a label that commands a premium in the market, standards like MSC's shift the cost of compliance from enforcement agencies to the producer, who is then faced with the choice of complying—and bearing the cost of enforcement in the form of the cost of obtaining and maintaining certification—or being left out of the market. The producer, then, can pass this cost on to consumers.

Private standard-setting already has an impact in other contexts[207] and is already at work in the shipping industry. One example is RightShip, a company that is equally owned by BHP Billiton, Rio Tinto, and Cargill. [208] Rightship focuses on helping

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201. *See Our History*, FORESTRY STEWARDSHIP COUNCIL, https://us.fsc.org/en-us/who-we-are/our-history (last visited Sept. 4, 2016) [http://perma.cc/27L8-DNEX] (archived Sept. 4, 2016) (describing how the Council was formed in the wake of the Rio summit's failure on deforestation in order to create a market-based approach that would be a voluntary alternative to counter-productive boycotts).

202. *See* Will Martin, *Marine Stewardship Council: A Case Study in Private Environmental Standard-Setting*, 44 Envtl. L. Rep. (Envtl. Law Inst.) 10097, 10097 (2014) ("The story of MSC's development provides a case study of how private environmental standard-setters can make change happen, outside the context of laws and regulation.").

203. *Id.*

204. *Id.*

205. *See* Roberts, *supra* note 159, at 154 (Voluntary certification and labelling systems "overcome collective-action problems to aggregate consumer demand, which supports a price sufficient to encourage producers and manufacturers to undertake the costs associated with shifting their production processes.").

206. *See id.* at 140.

207. *See, e.g.*, Vandenbergh, *Private Goverance, supra* note 24, at 150 ("[R]oughly sixty percent of the seafood caught for consumption from U.S. fisheries is certified or is from fisheries that are under assessment for certification.").

208. *Governance*, RIGHTSHIP, http://site.rightship.com/about/governance/ (last visited Sept. 4, 2016) [http://perma.cc/4S8A-7JBJ] (archived Sept. 4, 2016). While it is not an example of the kind of instruments of private governance discussed here, it bears

companies eliminate ships with inadequate safety standards from their supply chain, and has also created an emissions rating—on an A–G scale—in order to help customers make informed decisions about which ships to use.[209] This rating system focuses on design issues in existing ships. As a result, it does not take into account in-use efficiencies and so it does not fully rate all of the measurable aspects of a ship's emissions.[210]

Having a rating system in place can allow consumers to act on their environmental preferences: "[t]o the extent environmental protection is in a consumer's preference set, labeling systems provide the information about the provenance and performance of the good necessary to enable the consumer to act on the preference."[211] But these standards are not widely known outside of the industry. If these standards are to have a lasting and meaningful impact on the industry, they will also need to enhance their credibility by tackling the complete spectrum of a ship or fleet's emissions. In addition, standards like Rightship exemplify how private governance instruments can increase public participation, capitalizing on the private democratic processes that the MSC exemplifies, in order to ensure that stakeholders have a real impact on what standards will be set.[212]

An effective certification system for efficient shipping is one example of how the body of private governance tools can elicit compliance from shippers without the need for any particular flag state to impose requirements on its ships. It would create an incentive to

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mention that EfficientShip Finance is another actor in this field. The firm is an advisory and investment entity that focuses of fuel efficiency, investing in efficiency technologies on existing ships to reduce their carbon emissions. For more information, see NIKOS PETRAKAKOS, EFFICIENTSHIP FINANCE (2015), http://www.shippingefficiency.org/sites/shippingefficiency.org/files/press/files/Nikos%20Petrakakos%20p18-19%20Bulletin%20No2%202015%20lo-res.pdf [https://perma.cc/5ZL8-W5X6] (archived Oct. 23, 2016).

209. *GHG Emissions Rating,* RIGHTSHIP, http://site.rightship.com/services/ghg-emissions-rating/ (last visited Sept. 4, 2016) [http://perma.cc/6JSM-9DZM] (archived Sept. 4, 2016). RightShip lists five benefits of its environmental rating, which highlight the key issues here remarkably well. These include: "[informed selection for reducing emissions [2] opportunity for charterers to align vessel selection with their company sustainability standards [3] opportunity for charterers to reduce their bunker bills [4] rewarding and recognizing sustainable operators through greater acceptance of their ships [5] fast and easy access to data that has previously been dispersed and costly to gather. *Id.*

210. *Environmental* FAQs, RIGHTSHIP, http://site.rightship.com/faqs/environment-faqs/ (last visited Sept. 4, 2016) [http://perma.cc/UZ5V-JPTZ] (archived Sept. 4, 2016) ("The GHG Emissions Rating is calculated based on a vessel's design specifications and therefore is not impacted by the way the vessel is operated.").

211. Vandenbergh, *Private Governance*, *supra* note 24, at 167.

212. *See* Martin, *supra* note 202, at 10099 ("Scientific decisions [of the Marine Stewardship Council] are transparent and vetted through a technical advisory board of scientists, a stakeholder council, and then a public comment process, before the final product is sent to the board of trustees for consideration and adoption.").

obtain certification in order to charge a premium for lower-emissions shipping.[213] Because individual ship owners are able to charge more, they are no longer bearing a cost that creates a competitive disadvantage, thus addressing the problem of externalities. Because the standard-setting institution is not a function of any one government, compliance happens without regard to a vessel's flag state and occurs on the ship owner's own impetus. This eliminates the need for punitive enforcement and bypasses the political will obstacles that preclude strict standards in open-registry states.

2. Split Incentives Can Be Addressed by Supply Chain Contracting

Supply-chain pressure could drive a certification-and-standards system, or supply chain pressure could arise without a certification system at all. Corporations and other transnational organizations have significant power to affect behavior through supply chain contracting.[214] They exercise that power to generate a form of private environmental regulation as they feel pressure to control their suppliers from "the threat of contract or tort liability, consumer demand, targeting by name and shame campaigns and boycotts, and pressures from socially responsible investors." [215] Supply-chain pressures are thus not limited to large-scale corporate consumers who demand efficiency for its cost-effectiveness, but instead can include the actions of small businesses, organizations, and even individuals. Enforcement of environmental provisions in supply-chain contracts "occurs through shaming, boycotts, private inspections, contract terminations or non-renewals, and preferential purchasing, not just through government inspections and sanctions."[216]

In response to these pressures, firms place demands on their suppliers that go beyond the ordinary price demands for which any firm would negotiate in a private transaction. Instead, they make

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213. The reasons that a firm might be willing to pay more for efficient shipping are varied, but can include pressure from investors, a desire to avoid potential liability, or assuring long-term viability of a business model, among others. Michael P. Vandenbergh, *The New Wal-Mart Effect: The Role of Private Contracting in Global Governance*, 54 UCLA L. REV. 913, 917 (2007) [hereinafter *Wal-Mart*].

214. *See* Larry Catá Backer, *Private Actors and Public Governance Beyond the State: The Multinational Corporation, the Financial Stability Board, and the Global Governance Order*, 18 IND. J. GLOBAL LEGAL STUD. 751, 768 (2011) ("[C]orporations seek to regularize behavior through the application of behavioral norms or standards generated by other groups-particularly nongovernmental organizations that certify products and set standards, or standard-setters concerned with substantive rules for product production and quality.").

215. Tracey M. Roberts, *Innovations in Governance: A Functional Typology of Private Governance Institutions*, 22 DUKE ENVTL. L. & POL'Y F. 67, 87–88 (2011) [hereinafter Roberts, *Innovations in Governance*].

216. Vandenbergh, *Private Governance*, *supra* note 24.

demands that serve environmental ends, like requirements that suppliers reduce energy use or maximize efficiency—usually corresponding to lower emissions of greenhouse gasses.[217] A well-recognized consequence of this activity is that firms are able to impose quasi-regulatory requirements in foreign jurisdictions.[218] A firm in one country is able to use its contracting to meet internal and external demands for sustainability in the supply chain, even though the supplier's state may not otherwise provide adequate sustainability requirements. In this way, as Professor Roberts notes, "[s]upply chain contracts and operations permit anchor firms to transfer technology and management skills to countries where the rule of law and the regulatory apparatus is weak."[219] This form of private governance thus addresses inadequate environmental laws in flag states and can align incentives of charterers and ship owners. Chartering firms' use of this tool to require ship owners to meet their efficiency demands bypasses any need for flag states to enforce separate environmental provisions, and shifts the cost from the ship owner to the chartering firm—who may be better able to bear it and may be able to pass it on to consumers who are willing to pay for less carbon intensive products.

3. Private Solutions Avoid Many of the Problems that Plague Existing Proposals

This Note argues that private governance can replace its public counterpart in the context of reducing shipping's greenhouse gas emissions. To the extent that it does not fully do so, measures like those described here are technically and temporally gap-filling. They work to fill the gaps left by international legal instruments that contemplate carbon reductions insufficient to fully avoid the risk of catastrophic climate disruption, and they address the need to reduce climate change more quickly than current governance schemes would suggest.[220] They do so by creating private incentives and obligations that do not depend

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217. *See id.* 156.

218. *See* Roberts, *supra* note 159, at 126 (explaining the effect of firms placing requirements on their suppliers); *Wal-Mart, supra* note 213, at 970 ("[I]n many cases [private environmental governance] bypasses public entities altogether, transferring demands for social amenities directly from the citizens of one country to the firms operating in another."); Li-Wen Lin, *Legal Transplants Through Private Contracting: Codes of Vendor Conduct in Global Supply Chains as an Example*, 57 AM. J. COMP. L. 711, 716 (2009) ("[M]ultinational companies, backed by their strong bargaining power, have transmitted a new legal order to developing countries through contracting with local suppliers . . . .").

219. Roberts, *Innovations in Governance*, *supra* note 215, at 88.

220. *See* Vandenbergh *Private Governance*, *supra* note 24, at 162 ("Private governance measures also may fill gaps in timing that arise when a problem is identified but governmental processes require time to generate and enforce public measures (e.g., private labeling responses to tuna-dolphin concerns and ozone depleters).").

on a government (or governments) enforcing regulations, creating a price and market for carbon, or otherwise intervening in the industry. Rather than motivating compliance by threatening penalties, they generate an incentive to voluntarily comply by paying a premium for low-emissions shipping.

As discussed above, the currently-in-force international agreements do not successfully regulate shipping's carbon emissions now and are not likely to do so in the foreseeable future. MARPOL, however effective it may be or may eventually become in theory, suffers from enforcement deficits in states with open registries. Finally, despite its ambitious goals, the UNFCCC has proven to be ineffective to address this particular source of greenhouse gas emissions. Although there was significant and largely merited optimism surrounding early discussions of the Paris Agreement in other contexts, the Agreement failed to address shipping explicitly.

Both supply chain contracting and collective standard-setting can address this gap by bypassing the barriers to government action entirely. A company working to improve its environmental image can do so by requiring that ship owners take all the steps they can to improve efficiency. Not only does this address the external pressures that a firm could face, but it serves to decrease the fuel cost that the firm would pay. Comparably, a firm could break from usual practice and shift the cost of fuel to the shipper. This would mean changing which party bears the risk of under-estimating a voyage's fuel cost, potentially increasing costs. Such action would give ship owners an incentive to be as efficient as possible however, and the premium associated with being seen as an environmentally friendly company would work to offset the cost. This is a way of internalizing the climate costs of emitting carbon, and gives ship owners an independent incentive to do so.

V. CONCLUSION

Private environmental governance is a field of instruments that can regulate shipping's greenhouse gas emissions more effectively than public governance. It is more effective because it does not require states to undertake goal-setting or legislative processes that are subject to the limits of political feasibility. Instead, it bypasses many of the problems that make traditional regulation particularly challenging in the context of shipping. In addition, standards that are privately set can reach beyond the ceiling on reductions inherent in the Paris Agreement. As a result, private governance mechanisms that address greenhouse gas emissions more quickly than the international legal regime are feasible, and are effective alternatives to international agreements in this area.

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