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# INTERNATIONAL MARITIME ORGANIZATION'S REGULATION OF SULFUR EMISSIONS

*Jennifer M. Greene\**

The ocean has captivated the essence of humanity since the dawn of time. Great adventurers and explorers have traversed its vast span and still it is unconquered and alive. There are still uncharted depths, immense unknowns, and a raging power that reside in the ocean and its tides. President John F. Kennedy summarized the human spirit and its fascination with the ocean:

I really don't know why it is that all of us are so committed to the sea, except I think it is because in addition to the fact that the sea changes and the light changes, and ships change, it is because we all came from the sea. And it is an interesting biological fact that all of us have, in our veins the exact same percentage of salt in our blood that exists in the ocean, and, therefore, we have salt in our blood, in our sweat, in our tears. We are tied to the ocean. And when we go back to the sea, whether it is to sail or to watch it we are going back from whence we came.<sup>1</sup>

This interconnectivity and innate sense of wonder is merely the start. The seafaring vessels that traverse the ocean have since evolved from the humble wooden whaling ship to hulking behemoths as long as the Empire State building is tall.<sup>2</sup>

## I. AN AGE OF GIANT SHIPS AND GIANT PROBLEMS

The international shipping industry accounts for ninety percent of world trade by volume<sup>3</sup> and contributes only 2.7 percent of global greenhouse gases<sup>4</sup>

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<sup>1</sup> John F. Kennedy, Remarks at the America's Cup Dinner Given by the Australian Ambassador (Sept. 14, 1962).

<sup>2</sup> See John Farndon, *EYEWITNESS OIL 36* (2007) (comparing the Knock Nevis' length from bow to stern of 458.45 m and the Empire State building's height of 443 m).

<sup>3</sup> Target, EURONAV, <http://www.euronav.com/Page.aspx?id=1052>.

<sup>4</sup> See A.B. Sanderson, *Draconian EU Environmental Laws Threaten Shipping Industry*, BREITBAR (Oct. 17, 2014), <http://www.breitbart.com/london/2014/10/17/eu-draconian-environmental-laws/>

Shipping continues to be the most carbon efficient and least environmentally harmful way to transport goods internationally.<sup>5</sup> However it is far from environmentally friendly. The international shipping industry is still responsible for approximately one billion tons of greenhouse gas; to put this amount into perspective, it is a little more than the country of Germany.<sup>6</sup>

With a growing world economy and advancements in technology, the use of these seafaring vessels has developed an industry with its own set of unique challenges. The biggest obstacle for maritime trade is the environment. Presently, the environment has become a beacon for hope, a political buzzword, a commercial burden, and a difficult topic for all involved in both in demise and hopeful rejuvenation. The environment is being harmed, and the maritime shipping industry is contributing to this bleak fact.

The International Maritime Organization (IMO) predicts a correlated increase in both the demand on the shipping industry and harmful pollution resulting from increased demand; rough estimates predict pollution to increase between 50% and 250% in the next 35 years.<sup>7</sup> This is a grim projection for the future, but emission controls may be the key to avoiding this bleak statistic.<sup>8</sup> The big question for maritime trade is the environment: how can we protect our oceans, how can we prevent further harm, and how can we continue to grow this industry in an ecofriendly way?

There is positive news; steps have been taken to answer these questions and develop solutions. Guidance and regulations have been issued on sulfur oxide emission, , environmental standards are being enforced, and industry leaders, like Maersk, have taken strides to both set an example and increase compliance regarding new regulations.

While addressing environmental concerns, there are many problems new regulations cannot control. The International Maritime Organization (IMO), an international regulation body, created standards, but enforcement is not managed by IMO. The cost of compliance is expensive, more than fines for non-compliance. IMO created global standards, but countries have created additional regulations making compliance practically impossible. Lastly, technology is not cost-effective. The difficulties of enforcement and global

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<sup>5</sup> *See Id.*

<sup>6</sup> Megan Darby, *Global shipping emissions set to rise unchecked*, RTCC (Oct. 17, 2014), <http://www.rtcc.org/2014/10/17/global-shipping-emissions-set-to-rise-unchecked/>

<sup>7</sup> *See Id.*

<sup>8</sup> *See Id.*

compliance are incentive enough for industry players to skirt responsibilities and avoid environmental regulations.

## II. SULFUR OXIDE: WHAT, WHY AND HOW?

It is estimated that approximately 106,000 seafaring cargo vessels<sup>9</sup> traverse the oceans. The sheer volume of oceanic traffic greatly impacts the environmental stability of the ocean and the production of greenhouse gases. In particular, the new environmental regulations are targeting the release of sulfur oxides, an atmospheric emission.<sup>10</sup> The sulfur oxide content is caused by the use of bunker fuel to propel the behemoth shipping vessels.<sup>11</sup> Bunker fuel is defined as a cheap crude oil distillate, not particularly refined, which produces 3.5% sulfur oxide in vapor.<sup>12</sup> This noxious gas is the reason for the IMO's stringent regulation to stem emissions caused by bunker fuel consumption; the regulation took effect January 1, 2015.<sup>13</sup>

The International Maritime Organization proposed international regulations to reduce the maximum sulfur emission for all seafaring vessels.<sup>14</sup> The IMO created two separate acceptable sulfur emission levels depending on where a vessel is located.<sup>15</sup> The ocean is either an Emission Control Area (ECA) or not.<sup>16</sup> The ECAs are the Baltic Sea, the North Sea, The English Channel, and waters up to 200 miles from the coast of the United States and Canada.<sup>17</sup> The sulfur oxides allowed within the ECAs shifted from 1.0% to 0.1% by January 1, 2015.<sup>18</sup> This regulation is a 90% decrease of sulfur content in ECAs and has

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<sup>9</sup> See Goh Shu Hui, *Scrubber technology the most economic option for shipowners: BP Singapore*, PLATTS (Oct. 17, 2014, 9:35 AM), <http://www.platts.com/latest-news/shipping/singapore/scrubber-technology-the-most-economic-option-26908005>

<sup>10</sup> See *UK P&I Club: Emission Standards: Sox/NOx*, HELLENIC SHIPPING NEWS (Oct. 17, 2014), <http://www.hellenicshippingnews.com/uk-pi-club-emission-standards-soxnox/>

<sup>11</sup> Thomas Buckley, *Greening Of The Maritime Shipping Industry Is Cultivating Growth, M&A Opportunities*, FORBES (Oct. 22, 2014), <http://www.forbes.com/sites/mergermarket/2014/10/22/greening-of-the-maritime-shipping-industry-is-cultivating-growth-ma-opportunities/2/>

<sup>12</sup> See *Id.*

<sup>13</sup> See *Id.*

<sup>14</sup> Int'l Maritime Org. [IMO], Sulphur oxides (Sox) – Regulation 14, <http://www.imo.org/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Sulphur-oxides-%28SOx%29-%E2%80%93-Regulation-14.aspx> (last visited April 11, 2015).

<sup>15</sup> *Supra* note 11.

<sup>16</sup> See *SOx Scrubbing Made Simple*, AECMARITIME, [www.aecmaritime.com/eca](http://www.aecmaritime.com/eca) (last visited May 11, 2015).

<sup>17</sup> See *Id.*

<sup>18</sup> See Lusia Sykes & Valentin Kotlomin, *The winds of change*, ENERGY GLOBAL (Nov. 4, 2014), <http://www.energyglobal.com/news/special-reports/articles/The-winds-of-change-1562.aspx#.VGFZ8ofZb8m>

caused backlash from shipping industry giants.<sup>19</sup> The IMO has also approved maximum permissible sulfur content outside of ECAs from 3.5% to 0.5% by 2020.<sup>20</sup> The regulation will be implemented immediately, but will be revisited in 2018 to assess the feasibility of technological upgrades.<sup>21</sup> The revisit will determine if the deadline for implementation will need to be postponed to 2025.<sup>22</sup> This non-ECA IMO regulation has a more dramatic impact than the first regarding the ECAs because the non-ECA area will experience a 600% decrease in sulfur output.<sup>23\</sup>

### III. ENFORCEMENT PROBLEMS

The vessels are not solely owned by one company or manned by one particular country; this causes great difficulty in regulating vessels both in and out of ECAs.<sup>24</sup> The IMO and the UN Framework Convention on Climate Change (UNFCCC) have both taken steps towards stricter regulations of greenhouse gas emissions.<sup>25</sup> The difference between the two entities is noted in the geographic activity areas the regulations affect.<sup>26</sup> The IMO is mainly concerned with activities outside of the national boundaries and does not promote a more favorable treatment for different countries; the UN looks to cut emissions by focusing on a developed country holding itself to a higher standard of compliance.<sup>27</sup> The UN framework is derived by comparing the financial stability of developed nations with the social responsibility to shoulder the burden of global standards in order for less developed countries with weaker economies to grow while enjoying the ability to partake in international maritime trade.<sup>28</sup> These different frameworks create tension as the IMO has released a blanket regulation that will negatively affect the ability of less developed countries to compete in international maritime trade.

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<sup>19</sup> *See Id.*

<sup>20</sup> *See Id.*

<sup>21</sup> *See Id.*

<sup>22</sup> *See Id.*

<sup>23</sup> *See Id.*

<sup>24</sup> *See Id.*

<sup>25</sup> *See* Megan Darby, *Global shipping emissions set to rise unchecked*, RTCC (Oct. 17, 2014), <http://www.rtcc.org/2014/10/17/global-shipping-emissions-set-to-rise-unchecked/>

<sup>26</sup> *See Id.*

<sup>27</sup> *See Id.*

<sup>28</sup> *See Id.*

## IV. PROBLEMATIC REGULATORY ADDITIONS

In concurrence with the IMO regulation in non-ECA areas, the European Commission has decided to also enact the 0.5% sulfur limit by 2020; it will not be reconsidering or evaluating the feasibility of this action.<sup>29</sup> This particular regulation has caused dismay with both international shippers and predominantly localized European shippers because it adds an additional layer of confusion to the already strained regulatory scheme.<sup>30</sup> The European Commission is standing firm on its decision to regulate at a stringent level, regardless of the finding the IMO determines in 2018.<sup>31</sup> This dual standard of regulation causes considerable challenges for vessels operating predominantly in European Commission ECA, and also poses an increased risk for non-complaint vessels only sporadically entering the European Commission ECA.<sup>32</sup> With different regulatory schemes impacting different vessels in different ECAs at different times, it is understandable why the shipping industry is up in arms about the problems bound to arise from the lack of uniform regulations.<sup>33</sup> An official from the Cyprus Shipping Chamber explains “[the] regulations proposed will require that ships trading to Europe introduce additional [environmental compliance] measures both in terms of procedures, monitoring, reporting [and] equipment”.<sup>34</sup>

Shipowners have threatened to “flag out”, a backhand solution to the European Commission’s ECA regulation, by adopting a non-EU country to home the vessel.<sup>35</sup> This negatively affects the credibility of the regulation and also causes internal strife within EU shipping companies and non-EU countries.<sup>36</sup> Instead, it is argued that the regulatory changes must be enacted at an international level via the International Maritime Association.<sup>37</sup> In order for the regulations to take affect and truly make a difference in the sulfur oxide pollution levels, a communal acceptance will need to be reached.

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<sup>29</sup> *Supra* note 18.

<sup>30</sup> *See Id.*

<sup>31</sup> *See Id.*

<sup>32</sup> *See Id.*

<sup>33</sup> *See Cyprus Shipowners Say EU-Only CO2 Rules Harm Competitiveness*, SHIP & BUNKER (Oct. 17, 2014), <http://shipandbunker.com/news/world/162047-cyprus-shipowners-say-eu-only-co2-rules-harm-competitiveness> (expressing the views of Cypriot ship owners speaking out against EU regulations).

<sup>34</sup> *See Id.*

<sup>35</sup> *See A.B. Sanderson, Draconian EU Environmental Laws Threaten Shipping Industry*, BREITBAR (Oct. 17, 2014), <http://www.breitbart.com/london/2014/10/17/eu-draconian-environmental-laws/> (registering a ship in a country with less stringent regulations in order to avoid the EU regulations).

<sup>36</sup> *See Id.*

<sup>37</sup> *See Id.*

## V. THE COST-BENEFIT ANALYSIS OF CONSERVATION

The cost of decreasing sulfur oxide pollution is dramatic; the London-based International Chamber of Shipping approximates that the increased regulatory environment will cost the shipping industry an average of \$50 billion dollars a year.<sup>38</sup> This dramatic increase in cost to an already budget-constrained industry will create an influx of unemployment.<sup>39</sup> A present-day example is the Swedish Stena Line, a European ferry operator, who has already shed 800 jobs, equal to 30% of its workplace in order to accommodate the increased cost of compliance.<sup>40</sup> Stena Line's CEO explained that "[vessels] in the [European Union] area will adopt the new rules, but the vessels that are just crossing this area will have every incentive in the world to cut a corner".<sup>41</sup> The price of compliance is considerable, not only to the shipowners, but the regulatory agencies burdened by increased examinations and scientific findings.<sup>42</sup>

One particular cost that will drive the increased overall cost to the industry is low sulfur fuels like marine gasoil and marine diesel; these cleaner fuels will increase the cost of business considerably.<sup>43</sup> Both of these fuel types are greener alternatives to crude oil which has been predominately used as a fuel source and releases large quantities of sulfur oxide into the atmosphere.<sup>44</sup> The Swedish Maritime Administration estimates that the transportation costs per voyage will increase as much as 20% - 28%.<sup>45</sup>

This increase is major and will create an incentive to save money by skirting regulations; it has been noted that an oil tanker traveling the English Channel to Russia could save up to \$150,000 per voyage by braving the legal ramifications.<sup>46</sup> The dramatic cost increase for low sulfur emitting fuel causes a major competitive disadvantage for shipping companies that follow the

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<sup>38</sup> Costas Paris, *Shipping Regulators Go Full Speed Ahead on Emissions Controls*, WALL STREET JOURNAL (Nov. 7, 2014, 7:45 AM), <http://online.wsj.com/articles/shipping-regulators-go-full-speed-ahead-on-emissions-controls-1415364343>

<sup>39</sup> *See Id.*

<sup>40</sup> *See Id.*

<sup>41</sup> *See Id.*

<sup>42</sup> *See Id.*

<sup>43</sup> *See* Lusia Sykes & Valentin Kotlomin, *The winds of change*, ENERGY GLOBAL (Nov. 4, 2014), <http://www.energyglobal.com/news/special-reports/articles/The-winds-of-change-1562.aspx#.VGFZ8ofZb8m>

<sup>44</sup> *See Id.*

<sup>45</sup> *See Id.*

<sup>46</sup> *See* Corianne Egan, *Maersk: Ship operators skirting emissions regulations*, JOC.COM (Oct. 9, 2014, 3:51 PM), [http://www.joc.com/maritime-news/container-lines/maersk-ship-operators-skirting-emissions-regulations\\_20141009.html](http://www.joc.com/maritime-news/container-lines/maersk-ship-operators-skirting-emissions-regulations_20141009.html)

rules.<sup>47</sup> The difficulty is not only one with technicalities in different zones, but the enforcement and fining of ships is less than ideal for those on board with the environmental regulations.<sup>48</sup> Due to separate national authorities being responsible for ensuring ships comply with the new environmental regulations, only around one in every 1,000 ships are checked.<sup>49</sup> This low chance of being inspected coupled with the facts that fines are not an effective deterrent have left many industry players choosing the easy way out.<sup>50</sup> A prime example of this insufficient non-compliance fine occurs around the Baltic Sea.<sup>51</sup> The daily fine for non-compliance in the Baltic Sea is just under \$900.<sup>52</sup> Many would believe this is a hefty ticket, but in comparison to the cost of fuel, the choice between compliance and non-compliance becomes clear.<sup>53</sup>

A cargo ship using non-regulation crude oil, rather than marine diesel or gasoil, saves around \$11,000 a day in fuel costs.<sup>54</sup> If this same ship needs to spend eight days in the ECA zone to deliver cargo to Baltic Sea countries, the choice becomes remarkably clear. Sjoerd Hupkes Wijnstra, head of environmental affairs at Spliethoff ocean transport group explained “for a ship’s captain, the choice between an additional cost of €80,000 [~\$87,200 USD] and a potential fine of €800 [~\$900 USD] is an easy one”.<sup>55</sup>

## VI. COMPLIANCE NIGHTMARES FOR SULFUR OXIDE

Shipowners have become very suave in devising methods to dodge fuel regulations, including false tank allocation and botched fuel delivery receipts.<sup>56</sup> There have been numerous investigations into fuel delivery receipts, and the reality of the situation is that the ratio of heavy fuel oil use (bunker fuel) and marine gasoil use (low sulfur content fuel) is far from ideal.<sup>57</sup> False tank

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<sup>47</sup> *See Id.*

<sup>48</sup> *See Sulphur Directive pushes shipping into stormy waters*, HELLENIC SHIPPING NEWS (Mar. 9, 2015), <http://www.hellenicshippingnews.com/sulphur-directive-pushes-shipping-into-stormy-waters/>

<sup>49</sup> *See Id.*

<sup>50</sup> *See Id.*

<sup>51</sup> *See Id.*

<sup>52</sup> *See Id.*

<sup>53</sup> *See Id.*

<sup>54</sup> *See Id.*

<sup>55</sup> *See Id.*

<sup>56</sup> *See* Crystal Chan, *ECA cheating uncovered*, HIS MARITIME 360 (Oct. 6, 2014), <http://www.ihsmaritime360.com/article/14862/eca-cheating-uncovered>

<sup>57</sup> *See Id.* (explaining findings of shipowners “purchasing” 3,500 tons of heavy fuel and 1,500 tons of marine gasoil only to later find that the owners actually bought 200 tons of marine gas oil and instead purchased 4,800 tons of heavy fuel).

allocation often happen when the shipowner stores heavy fuel oil in a container labeled for marine gas oil; the level of fluid and the consumption of fuel is noted from the marine gas oil tank which creates a false reading for the compliance offices monitoring.<sup>58</sup> This skirting of regulations has raised the need for greater enforcement. Shipowners realize that enforcement is rare, and the fines for non-compliance are worth risking.<sup>59</sup> The health of the environment will continue to suffer from sulfur oxide unless stronger fines are imposed and a much stricter regulatory scheme is created.

## VII.A COMMERCIAL PROBLEM WITH A COMMERCIAL SOLUTION

Industry giants, like Maersk, who are too large and prestigious to shirk their environmental duties have called foul on their smaller competitors.<sup>60</sup> Many industry leaders are taking a stance for both the goodwill of the environment, and the commercial integrity of the shipping industry as a whole.<sup>61</sup> In particular, these players are purchasing marine gasoil to decrease sulfur oxide emissions and set the tone that the IMO regulations are here to stay and should be followed.<sup>62</sup> Increased regulations and urging from large name carriers will hopefully increase enforcement; a large initiative is necessary to change the current record of one out of 1,000 ships inspected for environmental compliance at ECA ports.<sup>63</sup>

### A. *Passing Along the Cost of Compliance*

An additional cost burden is increased carrier fees charged to shippers for the cost of new technology and lower sulfur emission fuels.<sup>64</sup> This additional charge will range in price depending on the carrier and geographic area of the ECA.<sup>65</sup> While this pass-through cost is never a welcome moment for shippers, it allows for carriers to continue offering services without becoming financially insolvent due to increased regulations.<sup>66</sup>

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<sup>58</sup> *See Id.*

<sup>59</sup> *Supra* note 48.

<sup>60</sup> *See Id.*

<sup>61</sup> *See Id.*

<sup>62</sup> *See* Peter T. Leach, *Maersk Joins Groups Monitoring Ship Emission Compliance*, JOC.COM (Nov. 6, 2014), [http://www.joc.com/maritime-news/container-lines/maersk-line/maersk-joins-group-monitoring-ship-emission-compliance\\_20141106.html](http://www.joc.com/maritime-news/container-lines/maersk-line/maersk-joins-group-monitoring-ship-emission-compliance_20141106.html).

<sup>63</sup> *See* Chan, *supra* note 56.

<sup>64</sup> *See* Leach, *supra* note 62.

<sup>65</sup> *See Id.*

<sup>66</sup> *See Id.*

Maersk Group CEO, Nils Semdegaard Andersen, explained that in order to create new carrier alliances and expand existing networks, investment must be placed in having better service and lower fuel emissions.<sup>67</sup> While this seems to be a self-explanatory statement, the way in which this is achieved is counter-intuitive.<sup>68</sup> Andersen's ground rule for environmental compliance and sustainable shipping revolves around a simple factor, "the bigger the ships and the more sailing [...], the better the environmental footprint".<sup>69</sup> Environmental footprints are a big debate in the international shipping industry and a larger vessel with both increased cargo capacity and decreased fuel consumption, removes the need for smaller, less environmentally friendly ships.<sup>70</sup> Andersen explains, "[t]he average size of Maersk's container fleet is exactly the average size of the world's fleet, [the difference is] that we have invested in more fuel-efficient vessels; we are not building them because we could afford it, but because we committed to reducing our CO2 footprint".<sup>71</sup> This logic, while future-oriented is how Maersk is able to offer competitive pass-through rates while keeping ahead of the economic dip that most carriers will face trying to keep up with both demand and environmental regulations.<sup>72</sup>

### *B. Technologic Alternatives*

While the purchase of low-sulfur emission marine gasoil and marine diesel, rather than crude oil, are the first order of change for international shipping vessels, additional environmental options do exist.<sup>73</sup> These options may need to be further explored as the increased need for low-sulfur emission fuels may create a strain on the oil industries ability to procure the necessary amounts.<sup>74</sup> Three alternatives to help ease the transition while reducing sulfur oxide emissions are: scrubbing technology liquefied natural gas vessels, and increasing refining capacity and upgrades.<sup>75</sup>

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<sup>67</sup> *See Id.*

<sup>68</sup> *See Id.*

<sup>69</sup> *See Id.*

<sup>70</sup> *See Id.*

<sup>71</sup> *Id.*

<sup>72</sup> *See Id.*

<sup>73</sup> *See Sykes & Kotlomin, supra note 17.*

<sup>74</sup> *See Id.*

<sup>75</sup> *See Id.*

### 1. *Scrubbing Technology*

Scrubbers function by injecting high volumes of water spray into the exhaust stream to cleans and absorb the sulfur from the exhaust on a vessel.<sup>76</sup> This is a viable option, but very costly; it is estimated that a smaller vessel may cost \$3 million to fit and a larger vessel may cost up to \$12 million to fit with scrubbers.<sup>77</sup>

There are differing opinions on the cost-benefit of scrubbers on ships; Maersk and Royal Caribbean, for example, have opposing viewpoints.<sup>78</sup> Recently, Royal Caribbean has announced that it will retrofit 19 cruise ships in order to meet the ECA's increased sulfur limits and to reduce the impact the ocean-going vessels have on air quality on the land and water surrounding the United States.<sup>79</sup> Royal Caribbean explains its research program "has developed exhaust gas scrubber technology that has the potential to provide greater emission reductions than would be achieved using only ECA compliant low-sulfur fuel, and at a much lower cost".<sup>80</sup> The state of the art scrubbers are estimated to remove up-to 97% of the sulfur dioxide emissions generated by the current fleet of diesel engines.<sup>81</sup> This decision was explained in press release by the company defending the choice to install the advanced emissions purification (AEP) scrubber systems; "instead of switching to a fuel with a lower sulfur content, [AEP systems] will ensure that RCL's ships can be compliant everywhere they sail, as availability of lower-sulfur fuels is limited".<sup>82</sup>

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<sup>76</sup> See Theresa Norton Masek, *RCCL to Install Environmental Scrubbers on 19 Ships*, TRAVELPULSE (Dec. 22, 2014, 3:00 PM), <http://www.travelpulse.com/news/cruise/rccl-to-install-environmental-scrubbers-on-19-ships.html>.

<sup>77</sup> See Sykes & Kotlomin, *supra* note 17.

<sup>78</sup> Compare Irene Ang & Adam Corbett, *Maersk Line leads ECA compliance with boxship yard tender*, TRADEWINDS NEWS (Nov. 7, 2014, 1:00 GMT), <http://www.tradewindsnews.com/weekly/348208/Maersk-Line-leads-ECA-compliance-with-boxship-yard-tender> (expressing Maersk CEO's perspective on scrubber technology); Masek, *supra* note 76; see also *Royal Caribbean scrubber move gets EPA, USCG nod*, MARINE LOG (Dec. 24, 2014), [http://www.marinelog.com/index.php?option=com\\_k2&view=item&id=8488:royal-caribbean-scrubber-move-gets-nod-from-epa-and-uscg&Itemid=231](http://www.marinelog.com/index.php?option=com_k2&view=item&id=8488:royal-caribbean-scrubber-move-gets-nod-from-epa-and-uscg&Itemid=231) (explaining US involvement and additional information regarding RCCL's decision to use scrubbers).

<sup>79</sup> See *Royal Caribbean scrubber move gets EPA, USCG nod*, MARINE LOG (Dec. 24, 2014), [http://www.marinelog.com/index.php?option=com\\_k2&view=item&id=8488:royal-caribbean-scrubber-move-gets-nod-from-epa-and-uscg&Itemid=231](http://www.marinelog.com/index.php?option=com_k2&view=item&id=8488:royal-caribbean-scrubber-move-gets-nod-from-epa-and-uscg&Itemid=231)

<sup>80</sup> *Id.*

<sup>81</sup> See Masek, *supra* note 76.

<sup>82</sup> See *Id.*

A large cost such as this may not be viable for many carriers and there are newly raised environmental concerns regarding the waste disposal of the scrubber water and the ever-present issue of a low supply of scrubbers being contested with a large demand.<sup>83</sup> Another significant challenge is the economic cost benefit due to the increased operation weight of an additional several hundred tons of equipment and the space needed for the pieces, some as large as a school bus.<sup>84</sup> Maersk CEO has concluded that it will not be using AEP scrubbers, stating “it seems odd that we should build a big process plant onboard a ship to take out sulfur instead of taking sulfur [out] at the refinery”.<sup>85</sup> Maersk has opted to instead spend \$550 million to construct ships with the purpose of operating with low-sulfur fuels rather than the heavy crude oil.<sup>86</sup>

## 2. *Liquefied Natural Gas*

Outfitting vessels to burn liquefied natural gas (LNG) is costly, but the advantage is the relative competitive pricing that LNG offers to carriers.<sup>87</sup> While LNG is a great alternative to purchasing scrubbers because it lacks the environmental waste implications, there are still numerous concerns regarding the availability of LNG, safety issues regarding its storage, and the relative lack of infrastructure in ports for LNG burning vessels.<sup>88</sup> The lack of infrastructure for maintaining ships using LNG is an additional setback to the economic cost of outfitting; it is more likely the case that a vessel will be transporting LNG for later consumption, than burning it as a fuel source.<sup>89</sup>

## 3. *Increasing Refinery Capacity*

An increased refinery capacity may be the best investment with the new regulatory environment regarding low-sulfur marine fuels.<sup>90</sup> This is a short-term solution to a long-term change for the international shipping industry, but

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<sup>83</sup> See Sykes & Kotlomin, *supra* note 17.

<sup>84</sup> See Masek, *supra* note 76.

<sup>85</sup> See Irene Ang & Adam Corbett, *Maersk Line leads ECA compliance with boxship yard tender*, TRADEWINDS NEWS (Nov. 7, 2014, 1:00 GMT), <http://www.tradewindsnews.com/weekly/348208/Maersk-Line-leads-ECA-compliance-with-boxship-yard-tender> (expressing Maersk CEO’s hesitancy to spend money on scrubbers).

<sup>86</sup> See *Id.*

<sup>87</sup> See Sykes & Kotlomin, *supra* note 17.

<sup>88</sup> See *Id.*

<sup>89</sup> See *Id.*

<sup>90</sup> See *Id.*

it will help to keep the cost of low-sulfur fuel manageable.<sup>91</sup> Additionally, there has been a circulating idea for a cost recovery program based on the cost to a carrier to switch from bunker fuels to low-sulfur marine gas oil.<sup>92</sup> This program would take into consideration the vessel size, speed, and cargo capacity in order to help mitigate the cost of the new emission regulations, estimated to cost an average of \$365 per ton.<sup>93</sup> While this price seems minor, consider that vessels average between 200,000 tons to 550,000 tons; this creates a much larger number.<sup>94</sup> There is no true ‘alternative’ to investing in newer, environmentally friendly technology, but the options presented help increase compliance by allowing for alternative means besides changing fuel types. It allows carriers to compromise between decreasing sulfur emissions and increasing operating costs.

### VIII. THE FUTURE OF AN INDUSTRY

Environmental regulations create both a positive and negative experience for all parties involved; there will always be negative financial impacts in the search of cleaner alternatives to an environmentally harmful industry. Finding a balance is difficult, not just for the international shipping carriers and passenger cruises, but also for the regulatory agencies.<sup>95</sup> Compliance is a difficult practice and increasingly creates hardships when the regulatory environment is stretched across both countries and oceans.

Within the increased cost for environmentally friendly technology is the ever-present problem of committing to a multi-national regulatory enforcement scheme.<sup>96</sup> While financially burdensome on its face, the increased environmental accountability holds an opportunity for growth.<sup>97</sup> For instance, Denmark’s Environmental Protection Agency plans to deploy drones over ship smoke stacks to measure sulfur emissions and areas along the Baltic coast may

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<sup>91</sup> See *Id.*

<sup>92</sup> See Corianne Egan, *Trans-Pacific shippers face low-sulfur fuel surcharges*, JOC.COM (Oct. 21, 2014, 11:51 AM), [http://www.joc.com/maritime-news/trade-lanes/trans-pacific/trans-pacific-shippers-face-low-sulfur-fuel-surcharges\\_20141021.html](http://www.joc.com/maritime-news/trade-lanes/trans-pacific/trans-pacific-shippers-face-low-sulfur-fuel-surcharges_20141021.html)

<sup>93</sup> See *Id.*

<sup>94</sup> See T. Mason Hamilton, *Oil tankers sizes range from general purpose to ultra-large crude carriers on AFR scale*, U.S. ENERGY INFORMATION ADMINISTRATION (Sept. 16, 2014), <http://www.eia.gov/todayinenergy/detail.cfm?id=17991>.

<sup>95</sup> See Masek, *supra* note 76.(expressing the fear of narrowing cruise itineraries because of the additional cost of environmentally friendly fuels).

<sup>96</sup> See Hui, *supra* note 9.

<sup>97</sup> See *Id.*

install “sniffer noses” under bridges to check emissions levels when vessels pass under.<sup>98</sup> This enforcement scheme creates a new area for employment and increases the need for new technologies. Additionally, another opportunity for growth exists among the mergers and acquisitions of environmental solution companies and the industry shipping giants.<sup>99</sup> It is estimated that the scrubber market could swell to \$15 billion by 2025 in order to meet the regulatory challenges that the sulfur emissions standards will create.<sup>100</sup>

The International Maritime Organization is leading the charge with such strict regulations, but each country will need contribute to a regulatory scheme in order ensure each fleet is properly in compliance. While the ECA regulations have stricter guidelines, the non-ECA areas will still need to develop regulatory schemes and enforcement strategies to reduce harmful air pollution emission such as nitrogen oxide, sulfur oxide, and particulate matter.<sup>101</sup> The ocean is not the responsibly of a single country to protect and a concentrated effort, both politically and industrially, will be necessary to achieve the high-reaching goals of the IMO in the fight for a cleaner and healthier global environment.

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<sup>98</sup> See Paris, *supra* note 37.

<sup>99</sup> See Buckley, *supra* note 11.

<sup>100</sup> See *Id.*

<sup>101</sup> See *supra* note 79.