HOW THE PUSH FOR CLEANER AIR DIRTIED THE WATER: THE SHIPPING INDUSTRY AND ITS IMPACT ON THE ENVIRONMENT

AMANDA COMINGS*

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INTRODUCTION

Nearly every product on the market originates from somewhere else in the world. Indeed, the global marketplace is primarily dependent on the shipping trade.[1] To illustrate the scale of this trade, if Maersk, one of the largest shipping companies in the world, lined up all of its containers, they would expand nearly halfway around the globe.[2] As a society, we have benefitted immensely from the fruitful advantages of overseas trading. It has become so common that we often forget that almost everything, at some point, has been loaded onto a cargo ship and traveled further than most people will travel in their lifetime. From microchips in cell phones to the pens buried at the bottom of handbags, from reusable water bottles to the bananas consumed for breakfast, life is filled with products that have traveled across the oceans.

However, as a society, we often overlook the significance of the ocean and underestimate our dependency on its resources. Indeed, without the routes of passage afforded by the ocean, we would not have many of the industries that are vital to the economy and the nation's livelihood. The sea is the primary mechanism upon which countries trade with each other.[3] In 2017 alone, the United States (U.S.) transported $1.6 trillion of international imports and exports through American ports.[4] The ocean is not only home to maritime trade but

1. *See Ocean Shipping and Ship Building*, OECD: BETTER POLICIES FOR BETTER LIVES, https://www.oecd.org/ocean/topics/ocean-shipping/ (last visited Apr. 24, 2023) [hereinafter OECD: BETTER POLICIES FOR BETTER LIVES]; *see* generally *Here are 5 Reasons Why the Ocean Is So Important,* WORLD ECON. F. (Aug. 29, 2019), https://www.weforum.org/agenda/2019/08/here-are-5-reasons-why-the-ocean-is-so-important/ [hereinafter *5 Reasons the Ocean Is So Important]*.

2. ROSE GEORGE, NINETY PERCENT OF EVERYTHING: INSIDE SHIPPING, THE INVISIBLE INDUSTRY THAT PUTS CLOTHES ON YOUR BACK, GAS IN YOUR CAR, AND FOOD ON YOUR PLATE 3 (2013).

3. OECD: BETTER POLICIES FOR BETTER LIVES, *supra* note 1; *5 Reasons the Ocean Is So Important*, *supra* note 1.

4. NAT'L OCEAN SERV., *How Important is The Ocean to Our Economy?*, NAT'L OCEANIC AND ATMOSPHERIC ADMIN., https://oceanservice.noaa.gov/facts/oceaneconomy.html (last updated Jan. 20, 2023). In the same year, the ocean economy supported 3.3 million American jobs and contributed $307 billion to U.S. gross domestic product. *Id.*

also to what provides the human population with life.[5] The ocean covers more than seventy percent of the Earth.[6] The ocean regulates our climate and produces the oxygen needed to breathe.[7] The ocean is rich with nutrients that provide sustenance to aquatic food, which fuels much of the world.[8] This fundamental resource serves as the basis for everyday life. Due to the ocean's importance, humanity must preserve the integrity of the water.

The following section provides context regarding the U.S.'s approach to protecting the ocean. The Clean Water Act, along with the International Convention for the Prevention of Pollution from Ships and the Marine Protection, Research, and Sanctuaries Act, were implemented to "restore and maintain . . . the Nation's waters."[9] Pollution is the introduction of hazardous materials into the environment, which have adverse environmental and health effects.[10] The Act addresses the discharge of pollutants in American waterways.[11] However, as other environmental issues have become the primary concern of environmental enthusiasts, it appears that the goal of preserving water quality has been set aside to ensure that other sources of pollution are addressed (like sources of air pollution).[12] For example, various incentive programs have been created to decrease air pollution emissions

5. Scott Minos, *Water—Our Most Precious Resource*, U.S. DEP'T OF ENERGY (Aug. 3, 2022), https://www.energy.gov/energysaver/articles/water-our-most-precious-resource.

6. *Why Do Oceans and Seas Matter?*, U.N. ENV'T PROGRAMME, https://www.unep.org/explore-topics/oceans-seas/why-do-oceans-and-seas-matter (last visited Apr. 24, 2023).

7. *Id.*

8. *5 Reasons the Ocean is Important*, *supra* note 1.

9. Cnty. of Maui v. Haw. Wildlife Fund, 140 S. Ct. 1462, 1468 (2020).

10. *Pollution*, NAT'L GEOGRAPHIC, https://education.nationalgeographic.org/resource/pollution/ (last visited Apr. 24, 2023).

11. 33 U.S.C.S. § 1251(a) (LexisNexis 2022).

12. Philip J. Landrigan et al., *Human Health and Ocean Pollution*, ANNALS OF GLOB. HEALTH 1, 3 (Dec. 3, 2020), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7731724/pdf/agh-86-1-2831.pdf. Common air pollutants include Ozone (also known as smog), Carbon Monoxide (from burning fuel), and Particulate Matter (a mix of tiny liquid and solid particles within the air). Heating and cooling homes, different transportation methods, and even wildfires cause air pollution. *See generally* AM. LUNG ASS'N, *What Makes Outdoor Air Unhealthy*, https://www.lung.org/clean-air/outdoors/what-makes-air-unhealthy (last updated Nov. 17, 2022).

from ships and ports.[13] Although these incentives have contributed to a decrease in air pollution, they have unfortunately generated an uptick in water pollution.[14] This phenomenon begs the question—why should all efforts be made to ensure one source of pollution is eliminated, if such efforts ultimately increase the levels of pollution in an alternative form? There is no simple solution. However, we must grapple with this question as water contamination causes at least $13 billion in damages to American industries annually.[15]

It is necessary to underscore that the oceans deserve the same effort the nation places into safeguarding the air. The nation must commit to creating intiatives that center on tackling ocean pollution and preventing further contamination. The ocean is deserving of the same protection and efforts we have shown to protecting the air. Indeed, to preserve the fresh air that we need to breathe, we must protect the oceans. Thus, adjustments to the current approach to environmental regulation is warranted. For example, in order for a ship to be considered "green," all aspects of the ship should be assessed. It is counter-

13. Clara Paola Camargo-Diaz et al., *A Review of Economic Incentives to Promote Decarbonization Alternatives in Maritime and Inland Waterway Transport Modes*, MDPI: SUSTAINABILITY 1, 9 (Nov. 3, 2022).

14. BRYAN COMER ET AL., *AIR EMISSIONS AND WATER POLLUTION DISCHARGES FROM SHIPS WITH SCRUBBERS*, INT'L COUNCIL ON CLEAN TRANSP. [ICCT] 3 (Nov. 2020), https://theicct.org/publication/air-emissions-and-water-pollution-discharges-from-ships-with-scrubbers/; *see* Erik Stokstad, *Shipping Rule Cleans the Air but Dirties the Water*, SCI. (May 13, 2021), https://www.science.org/content/article/shipping-rule-cleans-air-dirties-water.

15. Calvin Clark, *What Clean Oceans Mean for Food Safety*, STATE FOOD SAFETY, https://www.statefoodsafety.com/Resources/Resources/what-clean-oceans-mean-for-food-safety (last visited Nov. 28, 2022); U.N. ENV'T PROGRAMME, *Plastic Waste Causes Financial Damage of US$13 Billion to Marine Ecosystems Each Year as Concern Grows over Microplastics,* (June 23, 2014), https://www.unep.org/news-and-stories/press-release/plastic-waste-causes-financial-damage-us13-billion-marine-ecosystems. Plastic pollutants in the water alone impact the fishing industry and tourism, while water pollution in general leads to increases in water treatment costs, a reduction in waterfront property values, and overall damage to the shellfish industry. *See also* Kimberly Amadeo, *How Air, Water, and Plastic Pollution Affect the Economy: Dealing With the Rising Costs of Pollution*, THE BALANCE, https://www.thebalancemoney.com/pollution-facts-economic-effect-4161042 (last updated June 6, 2022).

productive to label a ship as green because of its efforts to reduce air emissions, if such efforts result in added ocean pollution.[16]

This Comment grappels with this issue by exploring the effect of the maritime shipping industry on ocean pollution and the environmental efforts in place to reduce pollution. This analysis critiques the directive of promoting cleaner air without comparable efforts to mitigating ocean pollution or acknowledging the fact that clean air initiatves can exacerbate the conditions of the ocean. In support of this notion, Part I considers the sheer significance of the ocean and the growing environmental harms caused by pollution. Then, Part II analyzes the shipping industry and its amassed effect on the environment. Specifically, Part II explores the environmental impact that results from shipping ports being shut down and cargo ships waiting in line for port entry. Correspondingly, Part III evaluates environmental programs created by the U.S. and the effort on behalf of international organizations to limit and regulate water pollution. Part IV observes how the push for a greener environment has led to increased air pollution regulation. Further, Part V underscores the need for further incentives designed toward reducing water pollution and suggests avenues that countries, companies, and consumers can engage in to protect the ocean. Finally, this Comment concludes by emphasizing the benefits of incentivizing the maritime industry—either through tax breaks on import and exports or in the form of direct monetary benefits for ships that follow environmental guidelines centered upon protecting the ocean.

This Comment is intended to illustrate that such programs could serve as a catalyst of environmental action and benefit all parties involved. Moreover, the lucrative industry offered by the ocean and its avenues for trade makes it economically feasible for shipping companies to comply with global emission standards. In turn, consumers who honor the ocean's importance should be motivated to shop at en-

16. A "green ship" is any "seagoing vessel that contributes" to improving the its environmental footprint, whether that be through decreasing emissions, consuming less energy, or just being overall more efficient. *See* Onur Yildirim, *Green Shipping Technology Changing the Industy*, ADVANCED POLYMER COATINGS, https://www.adv-polymer.com/blog/green-shipping (last visited Apr. 24, 2023).

vironmentally friendly retailers at all production levels.[17] Through these efforts, the world becomes cleaner and less polluted.

I. THE OCEAN'S IMPORTANCE AND HOW WATER POLLUTION EFFECTS THE ENVIRONMENT

Water is one of the most valuable resources on the planet; it is "the foundation of all life and important to . . . sustainability [and] economic growth."[18] Although the ocean is not typically utilized as a source of drinking water, the world relies on the sea for other crucial reasons. The ocean is essential in producing oxygen, regulating the climate, producing food, stimulating the economy, and encouraging research.[19] Despite these crucial benefits provided by the ocean, the nation's environmental approach has placed the ocean in substantial danger.

The pollution emitted from everyday activities poses grave risks to the ocean and the variety of ways it facilitates life. As the population grows, the ocean is increasingly subjected to higher levels of pollution. Without efforts to mitigate additional sources of pollution, other aspects of the climate are at risk. This is because the ocean acts as a fundamental resource in regulating the global climate.

Specifically, given the vast reach of the globe, the ocean is a crucial component of regulating carbon dioxide within the air. The ocean performs this fundamental task by absorbing excess heat and carbon dioxide within the air.[20] However, ocean acidification[21] is a conse-

17. Justine Calma, *Retail Giants Look to Greener Cargo Ships to Meet Climate Goals: Retailers' Climate Commitments Put Pressure on Supply Chains*, THE VERGE (Mar. 16, 2021, 10:58 AM), https://www.theverge.com/2021/3/16/22334173/retail-cargo-ships-climate-change-goals-maersk.

18. Minos, *supra* note 5.

19. *See 5 Reasons the Ocean is So Important*, *supra* note 1.

20. Landrigan, *supra* note 12, at 2.

21. Ocean acidification is the result of seawater becoming more acidic due to absorbing too much carbon dioxide from the atmosphere. Mixing water and carbon dioxide creates carbonic acid, which releases more hydrogen ions than carbonate ions into the water. The carbonate is essential for the health of coral reefs and building of shells. NAT'L OCEAN SERV., *What is Ocean Acidification?*, NAT'L OCEANIC AND ATMOSPHERIC ADMIN., https://oceanservice.noaa.gov/facts/acidification.html (last updated Jan. 20, 2023); *see also* Perrin Ireland & Shelia Hu, *Ocean Acidifica-*

quence of the increasing carbon dioxide levels the ocean must absorb. The ocean's increased carbon dioxide absorption affects the marine ecosystem and the services the ocean provides.[22] For example, acidification impacts marine ecosystems, including coral reefs and the organisms that live within the reef system. Acidification is expected to continue to raise the risk of harm to wildlife and humans.[23] By extension, water pollutants can reduce photosynthesis: the process essential to making the oxygen needed for life.[24] Pollutants—in the form of tangible items like plastic or less visible pollutants like dissolved chemicals—fundamentally interfere with the aquatic organisms that create the oxygen humans need to breathe.[25]

Marine organisms living in polluted waters should be a concern for everyone because these are the very food sources we eat. The ocean provides food to billions of people.[26] The human diet consists of essential nutrients the sea provides: almost 16% of the protein consumed comes from the ocean.[27] Eating foods that have been subjected to pollutants increases the risk of potential health problems.[28] There is well-founded fear of the occurrence of biomagnification, in which toxins from pollution increase in concentration as they are passed within

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tion: What You Need to Know, NAT'L RES. DEFENSE COUNCIL (Oct. 13, 2022), https://www.nrdc.org/stories/what-you-need-know-about-ocean-acidification.

22. *See Goal 14: Conserve and Sustainably Use the Oceans, Seas and Marine Resources for Sustainable Development*, U.N. DEP'T OF ECON. & SOC. AFF., https://sdgs.un.org/goals/goal14 (last visited Nov. 11, 2022).

23. U.N. Statistics Division, Sustainable Development Goals Report 2022, at 54 (Jul. 7, 2022), https://unstats.un.org/sdgs/report/2022/The-Sustainable-Development-Goals-Report-2022.pdf.

24. Landrigan, *supra* note 12, at 2, 5.

25. *See* Lina Zeldovich, *Is Plastic Pollution Depriving Us of Oxygen?*, JSTOR DAILY (Jun. 4, 2019), https://daily.jstor.org/is-plastic-pollution-depriving-us-of-oxygen/. Plastic pollution alone kills the bacteria which creates ten percent of the oxygen used to breathe. *Id.* Chemical pollutants derive from various sources, including pesticides, pharmaceuticals, and agricultural runoff. ONEOCEAN, *Marine Pollution*, https://www.oceanprotect.org/resources/issue-briefs/marine-pollution/ (last visited Apr. 23, 2023).

26. Landrigan, *supra* note 12, at 3.

27. *5 Reasons the Ocean is So Important*, *supra* note 1.

28. *See* Don Shepard, *Food Chains and How They are Affected by Water Pollution*, SCIENCING, https://sciencing.com/food-chains-affected-water-pollution-7712.html (last updated Mar. 13, 2018).

the food chain.[29] When toxins enter the water, they are absorbed by organisms at the bottom of the food chain, like phytoplankton, which in turn are eaten by creatures further up in the food chain; apex predators—animals at the top of the foodchain—end up with the highest concentration of toxins.[30] As a result, biomagnification enhances the risk that the food we consume is highly contaiminated.

Moreover, the future of the maritime industry relies on the health of the ocean. The maritime industry will employ an estimated 40 million people by 2030.[31] However, ocean pollution adversely impacts coastal businesses. The tourism, real estate, fishing, and shipping industries rely on healthy seas to stimulate their businesses.[32] Unfortunately, the fewer resources a country has, the less capable the country is of handling the impacts of ocean pollution.[33]

World leaders believe the ocean has a hand in solving collective world problems. Accordingly, the United Nations has set goals (like reducing world hunger and poverty) that depend on the ocean's health.[34] Moreover, our society's physical and mental health relies upon having safe access to an ocean free of pollution. Pollution results in an "estimated 9 million premature deaths a year," making it the world's most significant environmental cause of disease.[35] The impact of these pollutants on human health can affect children as young as infants still in the womb. In fact, studies have found that children born with exposure to these pollutants have a higher chance of damage to the developing brain, a lower IQ, and an increased risk of learning

29. *See* Clark, *supra* note 15; *see also* Jonathan Leibovic, *Biomagnification and Biolaccumulation*, NAT'L GEOGRAPHIC, https://www.nationalgeographic.org/activity/biomagnification-and-bioaccumulation/ (last visited Mar. 2, 2023).

30. See graphic diagram to better understand the impact at each stage of the food chain. Leibovic, *supra* note 29.

31. *5 Reasons the Ocean is Important*, *supra* note 1.

32. Kathryn A. Willis et al., *Cleaner Seas: Reducing Marine Pollution*, 32 REV. IN FISH BIOLOGY AND FISHERIES 145, 147 (2022).

33. *Id.*

34. *Why the Ocean Holds the Key to Sustainable Development*, WORLD ECON. F. (Jan. 14, 2019), https://www.weforum.org/agenda/2019/01/the-oceans-hold-the-key-to-sustainable-development [hereinafter *Ocean Holds the Key*].

35. Landrigan, *supra* note 12, at 3. Pollution impacts physical and mental well-being by eating contaminated foods or being exposed to harmful "blooms." These coastal pollution blooms, commonly known as "'red,' 'green,' or 'brown tides,'" can cause neurological issues or even death when ingested. *Id.* at 35–36.

disorders.[36] Adults are at risk for cancer, neurological damage, and respiratory damage.[37]

The ocean also has a unique cultural value to many countries, specifically those in the Arctic, Global South, and other coastal communities.[38] People find happiness and peace being near the water and participating in many activities involving and surrounding the ocean.[39] However, when polluted, the ocean, which was once a place of beauty and solace, can adversely affect human health. Although the most visible form of ocean pollution is the trash that appears on shore, it is only the beginning. Oil spills, microscopic plastic particles, fertilizer runoff, and chemicals from everyday products all impact the health of the ocean and the animals that inhabit it.[40]

Ocean pollution is pervasive and largely uncontrolled.[41] The ocean can only absorb so much carbon dioxide; once it has reached its limit, it will not be as impactful in moderating climate change.[42] Therefore, preventing ocean pollution can work toward saving the environment, improving human health, and stimulating the global economy.[43]

II. THE SHIPPING INDUSTRY AND ITS IMPACT ON THE ENVIRONMENT

The shipping industry is not new. The ocean provides the primary source of transportation for global trade.[44] People have been sending goods by water for over 4,000 years, dating back to fifteenth-century Egypt.[45] The shipping industry is responsible for over eighty percent

36. *Id.* at 2.
37. *Id.*
38. *Id.* at 3.
39. *Id.*
40. NAT'L OCEANIC AND ATMOSPHERIC ADMIN., *Ocean Pollution and Marine Debris*, https://www.noaa.gov/education/resource-collections/ocean-coasts/ocean-pollution (last updated Apr. 1, 2020). *See generally* Zahra Ahmed, *10 Types of Ocean Pollution*, MARINE INSIGHT (Dec. 1, 2022), https://www.marineinsight.com/environment/types-of-ocean-pollution/.
41. Landrigan, *supra* note 12, at 35.
42. U.N. Statistics Division, *supra* note 23, at 54.
43. Landrigan, *supra* note 12, at 2.
44. OECD: BETTER POLICIES FOR BETTER LIVES, *supra* note 1.
45. GEORGE, *supra* note 2, at 5.

of global trade transportation, carrying upwards of seventy percent of the value of the global trade economy.[46] Nevertheless, most individuals do not think about where the vast majority of their belongings come from. Within the U.S. alone, American ports[47] bring in forty percent of global imports and ship out thirty percent of American exports.[48] In 2011, U.S. ports imported $1.73 trillion worth of international goods being transported through these channels.[49] Indeed, within the parameters of the West Coast, the Ports of Los Angeles and Long Beach are considered some of the busiest container ports in the nation.[50] These ports serve as home bases for international and domestic shipping companies.[51]

In recent years, ports worldwide have experienced a slight decrease in mobility. "Global maritime mobility reductions not only [impact] global trade and the economy, but also the environment: especially sea pollution."[52] When ports slow down (like during the beginning stages of the COVID-19 pandemic), ships are often left idling outside ports waiting for entry.[53] The following example is illustrative of this phenomenon. Typically, the ships lined up waiting to come into the Ports of Los Angeles and Long Beach are split into two groups: one that goes to a designated anchorage and one that waits in

46. Leonardo M. Millefiori et al., *COVID-19 Impact on Global Maritime Mobility*, 11 SCI. REP. 1, 2 (2021).

47. Generally, a port is a place where ships dock while cargo is transferred between ships and trucks, trains, or storage facilities. BUREAU OF TRANSP. STAT. *Definition of Ports and Methods Used to Identify the Top 25 Ports by Total Tonnage, Twenty-Foot Equivalent (TEU), and Dry Bulk Tonnage*, (Jan. 26, 2017), https://www.bts.gov/archive/publications/port_performance_freight_statistics_annual_report/2016/ch2.

48. Gabrielle Cannon, *Ships Backed Up Outside U.S. Ports Pumping Out Pollutants as They Idle*, THE GUARDIAN (Oct. 15, 2021, 7:05 AM), https://www.theguardian.com/business/2021/oct/15/us-california-ports-ships-supply-chain-pollution.

49. GEORGE, *supra* note 2, at 3.

50. Kathryn Royster, *What is the LA Port's Shipping Backlog Doing to Southern California's Environment?*, USC DORNSIFE COLLEGE OF LETTERS, ARTS AND SCIENCES (Feb, 16, 2022), https://dornsife.usc.edu/news/stories/3636/la-shipping-backlog/.

51. *Id.*

52. Millefiori, *supra* note 46, at 2.

53. *Id.* at 1.

deeper water until an anchorage spot opens up.[54] On the East Coast, the ships wait offshore about three miles for port space to open up.[55] In order to limit the spread of COVID-19, seaports closed down, limiting (and sometimes banning) cruise traffic.[56] National and local restrictions were also enforced, leading to delayed port clearances. In some cases, the limitations included refusing port entry and refueling ships.[57]

This is problematic because idling ships compound the levels of contaminants and pollutants "that impact the local environment, coastal communities, and . . . carbon targets," which exacerbates climate change.[58] Even before the backlog of ships awaiting entrance, during the time when ships could enter ports freely, ports such as the Port of Long Beach and Los Angeles produced more than 100 tons of smog per day.[59] As such, the backlog dramatically exacerbated smog levels due to the fact as many as seventy ships remained anchored awaiting entry at any given time.[60]

To demonstrate the gravity of this issue, if the shipping industry were considered its own country, it would be the sixth largest producer of greenhouse gas emissions in the world.[61] Approximately twenty-five percent of the pollution in the sea comes from a combination of maritime activity and ocean dumping.[62] In an effort to curb air pollution, shipping companies install scrubbing systems on cargo ships.[63]

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54. Augusta Saraiva & Brendan Murray, *Every Step of the Global Supply Chain is Going Wrong—All at Once*, BLOOMBERG (Nov. 22, 2021), https://www.bloomberg.com/graphics/2021-congestion-at-americas-busiest-port-strains-global-supply-chain/.

55. Amanda Kwan, *When it Comes to Container Ships at Anchor, Looks are Deceiving*, PORT AUTH. NY NJ (July 13, 2022), https://www.panynj.gov/port-authority/en/blogs/sea/when-it-comes-to-container-ships-at-anchor—looks-are-deceiving.html.

56. Millefiori, *supra* note 46, at 2.

57. *Id.*

58. Cannon, *supra* note 48.

59. *Id.*

60. *Id.*

61. OCEANA EUROPE, *Shipping Pollution*, https://europe.oceana.org/shipping-pollution-1/ (last visited Nov. 11, 2022). Following behind the U.S., China, Russia, India, and Japan in the emission of carbon dioxide. *Id.*

62. GEERT POTTERS, MARINE POLLUTION 5 (5th ed. 2002).

63. Stokstad, *supra* note 14.

These systems capture exhaust pollutants by sending the exhaust through a cylinder, where it is sprayed with water, and then dumped into the ocean.[64] Through these processes at least ten gigatons of wastewater are released into ports annually, deteriorating sensitive marine ecosystems.[65] The installation of these scrubbing systems has increased substantially in the past decade. In 2008, there were only three ships with scrubbers; in 2020, 4,300 ships had the systems installed on board.[66] While the shipping industry claims that the dumped waste exuded from scrubbing systems does not exceed any national or international limits, the sheer volume is still a cause for concern.[67] Ports are subjected to significant levels of wastewater discharge. This is especially troublesome because ports are more shallow than the open ocean and as a result, the pollutants are more potent and accumulate faster.[68]

III. DIFFERENT ENVIRONMENTAL PROGRAMS ADDRESSING WATER POLLUTION

International organizations and nonprofits have worked tirelessly to save the ocean from pollution. Amongst the different water pollution reduction programs, the International Convention for the Prevention of Pollution from Ships; the Clean Water Act; and the Marine Protection, Research, and Sanctuaries Act all establish limits and regulations dealing with water pollution. Given the expansive nature of the ocean and the vital role maritime trade plays in the global economy, it is crucial to first understand how the shipping industry impacts the surrounding water.

A. The International Convention for the Prevention of Pollution from Ships

The central entity for preventing marine environment pollution, the International Convention for the Prevention of Pollution from

64. *Id.*

65. *Id.*

66. COMER, *supra* note 14, at 11.

67. Stokstad, *supra* note 14. Regardless of being within the limits allowed, researchers are worried the pollutants will accumulate over time. *Id.*

68. *Id.*

Ships (MARPOL), was initially adopted in 1973 by the International Maritime Organization (IMO).[69] MARPOL was established to prevent ships from further polluting the ocean both in the course of operation and in the event of an accident.[70] MARPOL monitors all types of ship pollution and is recognized as the predominant international agreement governing this issue.[71] In addition, MARPOL regulates six different issues (referred to as annexes) to prevent and minimize ship pollution.[72]

Annex I (A-I) prohibits all ships from discharging oil and oily mixtures into the sea.[73] Additionally, A-I provides specific requirements for new oil tankers, including implementing double hall designs. It also requires older tankers to take steps toward adding a second hull.[74] Annex II (A-II) addresses four different categories of poisonous liquid substances emerging from ballast and tank cleanings and imposes limitations regarding when and where each category of toxins can be disposed.[75] All nations participating in MARPOL must

69. INT'L MAR. ORG., *International Convention for the Prevention of Pollution from Ships (MARPOL)*, https://www.imo.org/en/About/Conventions/Pages/International-Nov. 11, 2022) [hereinafter IMO: *MARPOL*]. The IMO is a U.N. entity that works with 174 countries to create rules for international shipping. *See* Stokstad, *supra* note 14.

70. IMO: *MARPOL*, *supra* note 69.

71. U.S. ENV'T PROT. AGENCY, *MARPOL Annex VI and the Act to Prevent Pollution from Ships (APPS),* https://www.epa.gov/enforcement/marpol-annex-vi-and-act-prevent-pollution-ships-apps (last updated Sep. 19, 2022) [hereinafter *Annex VI & APPS*].

72. IMO: *MARPOL, supra* note 69; Royster, *supra* note 50.

73. International Convention for the Prevention of Pollution from Ships, Nov. 2, 1973, 12 I.L.M. 1319 [hereinafter MARPOL 1973]. While the annex bans the release of oil from ships, it is not a one size fits all model. A-I sets different limits on what a ship needs depending on the ship's size. For example, to combat oil from entering the ocean, A-I requires that ships over 400 tons be fitted with a filtration system separating oil from water and that ships over 10,000 tons also have a discharge monitoring system. *Id.*

74. IMO: *MARPOL, supra* note 69.

75. MARPOL 1973, *supra* note 73. Different measures include pumping waste into different receptacles where the concentration of the noxious waste can fall below certain limits, ensuring that when waste is dispelled, it is at least twelve nautical miles from shore and in water at least eighty-two feet (twenty-five meters) deep; and regulating the speed of the ships that disperse the substances. *Id.*

adopt A-I and A-II.[76] These two annexes are vital to minimizing water pollution as they regulate two types of liquid substances; potential spillage from either substance is, theoretically, more challenging to clean up than tangible pieces of garbage falling overboard.

While A-I and A-II are mandatory, Annexes III-VI are optional to implement.[77] Annex III (A-III) states that carrying harmful substances—those that the International Maritime Dangerous Goods Code deems as marine pollutants—is prohibited on all ships unless they are clearly marked to indicate harmful contents.[78] Annex IV (A-IV) prohibits sewage discharge into the sea unless there is an approved sewage treatment system on the ship or the sewage is treated by an approved system and then dumped at least three nautical miles from shore.[79]

The fifth annex (A-V) prohibits the disposal of plastics into the sea and limits the disposal of garbage based on the distance in nautical mileage from the nearest land mass.[80] A-V applies to all ships, regardless of size, in countries that adopt this provision but specifically bans all disposal of plastics into the ocean.[81] Implementing A-V is vital for

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76. U.S. COAST GUARD: U.S. DEP'T OF HOMELAND SEC., *Office of Commercial Vessel Compliance (CG-CVC)*, https://www.dco.uscg.mil/Our-Organization/Assistant-Commandant-for-Prevention-Policy-CG-5P/Inspections-Compliance-CG-5PC-/Commercial-Vessel-Compliance/Domestic-Compliance-Division/MARPOL/ (last visited Nov. 23, 2022) [hereinafter COAST GUARD *Vessel Compliance*].

77. *Id.*

78. MARPOL 1973, *supra* note 73; IMO: *MARPOL, supra* note 69. A-III also sets limitations as to the number of harmful substances that can be carried on a single ship. MARPOL 1973, *supra* note 73. The limitations depend on the size of the ship, as well as the packaging and nature of the harmful substances. *Id.*

79. MARPOL 1973, *supra* note 73 IMO: *MARPOL, supra* note 69. Sewage that has not been treated must be discharged at least 12 nautical miles from shore. IMO: *MARPOL, supra* note 69. A-IV is applied differently depending on the size and age of the ship. MARPOL 1973, *supra* note 73. After a ship is surveyed by the ship's home country, it can be issued an International Sewage Pollution Prevention Certificate that is valid for no more than five years. *Id.* There is a grace period for certification depending on certain factors like a ship being offshore when certification ends. *Id.* The surveys include checking that any sewage treatment operations meet Organization standards, ensuring that any disinfectant systems comply with Administration requirements, and confirming that any holding tanks are up to Administration satisfaction depending on a variety of factors. *Id.*

80. *Id.*

81. *Id.*

countries to implement as the presence of plastics in the ocean significantly impacts integral food sources for humans.

Finally, Annex VI (A-VI) deals explicitly with air pollution. A-VI establishes limits on diesel engines' sulfur and nitrogen oxide emissions.[82] A-VI applies to all U.S. ships and any ship operating within 200 nautical miles off the North American Coast.[83] A-VI has become the leading international treaty addressing the reduction of air pollution by ships.[84] In discussions about air pollution limitations, countries must comply with the IMO emission guidelines set forth within this annex.

Violations of any of the adopted MARPOL annexes are punishable under the law of the country (as a party to MARPOL) where the violation occurred or the domestic laws and jurisdiction of the flagged ship.[85] However, the regulations of each annex provide that if any of the waste is a result of life-saving measures or for the safety of the ship, then the prohibitions and limits do not apply.[86]

Due to the U.S.'s interest in MARPOL, in 1980, the nation passed the Act to Prevent Pollution from Ships (APPS), which specifically addressed MARPOL A-I and A-II, and later incorporated parts of the other annexes.[87] Currently, the U.S. has incorporated A-I, A-II, A-V, and A-VI into APPS. MARPOL and APPS are so closely related that "[a] violation of APPS is defined as a violation of MARPOL."[88] While the U.S. has not formally adopted Annex IV, other federal acts have created similar regulations regarding ship-generated sewage.[89]

82. Royster, *supra* note 50; *Annex VI & APPS*, *supra* note 71.

83. *Annex VI & APPS*, *supra* note 71.

84. *Id.*

85. MARPOL 1973, *supra* note 73.

86. *Id.*

87. Yale Lewis, *Cargo Residues & Cargo-Associated Garbage: Are They Regulated by the Ocean Dumping Act or the Act to Prevent Pollution from Ships*?, 14 U. S.F. MAR. L. J. 269, 290 (2001).

88. *Id.* at 291. APPS violations can lead to criminal or civil penalties. *Id.*

89. COAST GUARD *Vessel Compliance*, *supra* note 76. The Clean Water Act encompasses similar regulations as Annex IV regarding ship sewage pollution. *Id.*

B. The Clean Water Act

The Clean Water Act (CWA),[90] created a basic framework for regulating pollutant discharge entering U.S. waters.[91] The CWA represents the first significant law enacted by the U.S. addressing water pollution.[92] The CWA aimed to "restore and maintain the chemical, physical, and biological integrity" of American waters.[93] Moreover, its objective was to eliminate pollution[94] discharge[95] within U.S. navigable waters[96] by 1985.[97] Accordingly, the Act "forbids the 'addition' of any pollutant from a 'point source'[98] to 'navigable waters' without

90. 33 U.S.C. § 1251 et seq.

91. *Summary of the Clean Water Act*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/laws-regulations/summary-clean-water-act (last updated Jul. 6, 2022) [hereinafter *CWA Summary*]. The CWA was formerly known as the Federal Water Pollution Control Act of 1948, but due to growing concern and public awareness of water pollution levels, the Act was amended in 1972 to what it is commonly known as today. *Id.*

92. *Id. See also* U.S. ENV'T PROT. AGENCY, *History of the Clean Water Act*, https://www.epa.gov/laws-regulations/history-clean-water-act (last updated Jul. 6, 2022).

93. 33 U.S.C.S. § 1251(a) (LexisNexis 2022).

94. Under the CWA, pollution is any manufactured or man-induced modification to the water's integrity (whether chemical, physical, or biological). 33 U.S.C.S. § 1362(19) (LexisNexis 2022). A pollutant can be solid waste, garbage, sewage, chemical waste, or biological waste. 33 U.S.C.S. § 1362(6) (LexisNexis 2022). However, a pollutant does not include sewage from vessels or discharge incidental to the normal operation of a vessel of the Armed Forces. *Id.*

95. Discharge includes any spilling, leaking, pumping, emptying, or dumping, but an exception exists for discharge permitted under the National Pollutant Discharge Elimination System. 33 U.S.C. § 1342 (LexisNexis); 33 U.S.C.S. § 1321(a)(2) (LexisNexis 2022).

96. Navigable waters encompass the waters of the United States (WOTUS), including the territorial seas of the U.S. Anthony Francois, *The New Navigable Waters Protection Rule*, PROP. AND ENV'T RSCH. CTR., https://www.perc.org/2020/01/28/the-new-navigable-waters-protection-rule-explained/ (Jan. 28, 2020). Territorial seas generally include three miles offshore into the ocean. *Id.* By extending navigable waters to include the territorial seas, the CWA "protects against offshore discharge from sewage plants, power plants, factories, and oceangoing vessels." *Id.*

97. § 1251(a)(1).

98. A point source is "any discernible, confined, and discrete conveyance . . . from which pollutants can be discharged." 33 U.S.C.S. § 1362(14) (LexisNexis 2022). Point sources include pipes, ditches, channels, tunnels, vessels, and other floating crafts. However, point sources do not include discharge from agricultural stormwater or return flow from agriculture irrigation. *Id.* Most permitting systems

the appropriate permit from the Environmental Protection Agency (EPA)."[99]

Unregulated pollution discharge emerging from point sources causes water pollution and is highly toxic to humans and wildlife.[100] Determining whether a pollutant is harmful depends on various factors, such as the type and concentration of the pollutant or chemical, when the chemical was released, the weather conditions during release, and what organisms live in the release area.[101] As a result, all persons seeking to discharge pollution into U.S. waters must obtain express permission from the EPA.[102] Correspondingly, the CWA implemented programs that set limits and recommendations for pollutants in U.S. navigable waters.[103]

In 1972, the CWA created the National Pollutant Discharge Elimination System (NPDES).[104] The NPDES adopted a permit structure that transformed the general obligations of the CWA into specific provisions addressing different limitations of pollutant discharge.[105] Permits authorized under the NPDES specify acceptable levels of pollutants and ensure that mandatory state standards and federal minimums for clean water are met.[106] While the permits include information about best practices, the program allows permittees to decide how to

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deal with direct point sources, where pollutants enter U.S. waters. U.S. ENV'T PROT. AGENCY, *Watershed Academy Web: Introduction to the Clean Water Act,* ttps://cfpub.epa.gov/watertrain/moduleFrame.cfm?parent_object_id=2100 (last updated Nov. 23, 2022). Indirect point sources do not require the same permits as direct point sources. Typically, indirect point sources are covered by a "pretreatment" program under the CWA. *Id.*

99. Cnty. of Maui v. Haw. Wildlife Fund*,* 140 S. Ct. 1462, 1468 (2020).

100. NAT'L OCEAN SERV., NAT'L OCEANIC AND ATMOSPHERIC ADMIN., *Point Source: Pollution Tutorial*, NOAA, https://oceanservice.noaa.gov/education/tutorial_pollution/03pointsource.html (last visited Nov. 11, 2022).

101. *Id.*

102. Cnty. of Maui v. Haw. Wildlife Fund*,* 140 S. Ct. at 1468.

103. *Id.* at 1462.

104. 33 U.S.C. § 1342; U.S. ENV'T PROT. AGENCY*, National Pollutant Discharge Elimination System: [hereinafter: About NPDES*, https://www.epa.gov/npdes/about-npdes (last updated July 6, 2022).

105. *About NPDES, supra* note 104.

106. *Id.*

best manage the levels of pollutants allowed under the permit.[107] The EPA authorizes the NPDES program in tribal, state, and territorial governments to execute various administrative tasks such as licensing and enforcement measures.[108] For example, whether an individual or an organization needs a permit depends on where the pollutants are being sent: discharge from point sources into U.S. waters requires a permit, whereas discharge into a municipal sanitary sewer system does not.[109]

Effluent limitations are the primary way of controlling the discharge of pollutants into the water.[110] To determine permit limits, permit writers consider the technology available to control pollutants and corresponding limits that protect water quality standards.[111] The Toxic Pollutant List was established to ensure that regulations from the Effluent Guidelines' standards for water quality and the NPDES' permit requirements applied to waterway toxins.[112] Because the Toxic Pollutant List included only broad categories of pollutants, the Priority Pollutant List was created in 1977 to address individual pollutants. This made implementing the Toxic List more feasible for water testing and regulation.[113]

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107. U.S. ENV'T PROT. AGENCY, *National Pollutant Discharge Elimination System (NPDES)*, EPA, https://www.epa.gov/npdes (last updated Sept. 30, 2022). Every permit ensures that mandatory state standards and federal minimums for clean water are met. *Id.*

108. *Id.*

109. U.S. ENV'T PROT. AGENCY, *National Pollutant Discharge Elimination System: NPDES Permit Basics*, EPA, https://www.epa.gov/npdes/npdes-permit-basics (last updated Sept. 7, 2022).

110. U.S. ENV'T PROT. AGENCY, *National Pollutant Discharge Elimination System: NPDES Permit Limits*, https://www.epa.gov/npdes/npdes-permit-limits (last updated Oct. 3, 2022). These limitations are established by the EPA for various non-municipal categories. *Id.*

111. *Id.*

112. U.S. ENV'T PROT. AGENCY, *Toxic Priority Pollutants Under the Clean Water Act,* EPA, https://www.epa.gov/eg/toxic-and-priority-pollutants-under-clean-water-act (last updated July 10, 2021).

113. *Id.*

C. The Ocean Dumping Act

The ocean was previously perceived as a dumping ground for waste, chemicals, sewage, and other contaminated materials.[114] Consequently, some areas of the ocean became severely toxic and depleted the oxygen levels within the water.[115] In response to this issue, in 1972, Congress declared that the U.S. would regulate the dumping of waste and hazardous materials that could negatively affect the well-being of humans and the environment.[116] In addition, the Marine Protection, Research, and Sanctuaries Act (MPRSA) (sometimes known as the Ocean Dumping Act) established permit requirements and enforcement regimes to regulate the practice of ocean dumping.[117] Notably, the MPRSA strictly bans disposing of radioactive, chemical, and biological wastes.[118] In addition, under the MPRSA, all dumping is prohibited within twelve nautical miles of the U.S., except as permitted.[119]

Additionally, the MPRSA regulates ocean dumping procedures implored by American-flagged ships.[120] Permits issued under the MPRSA specify the type of materials that ships can dispose of, the amount of waste, and the location for disposal.[121] Permits also specify the duration permit holders can engage in ocean dumping.[122] A violation of the terms or conditions of the license warrants the EPA to take action in the form of civil or criminal penalties.[123] Indeed, the EPA is

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114. U.S. ENV'T PROT. AGENCY, *Learn about Ocean Dumping*, EPA, https://www.epa.gov/ocean-dumping/learn-about-ocean-dumping#MPRSA (last updated Oct. 27, 2022). This practice was based on the rationale that the ocean had a limitless capacity to dispose of waste. *Id.*

115. *Id.*

116. *Id.*

117. *Id.* The Act also provided provisions authorizing marine research. *Id.*

118. LOUIS B. SOHN ET AL., LAW OF THE SEA IN A NUTSHELL 392 (2nd ed. 2010); U.S. ENV'T PROT. AGENCY *Administering the Ocean Dumping Act*, EPA J. 9 (1975).

119. CLAUDIA COPELAND, CONG. RSCH. SERV., RS20028, OCEAN DUMPING ACT: A SUMMARY OF THE LAW 2 (2010).

120. *Id.*

121. *Id.* at 3.

122. *Id.*

123. *Id.*

authorized to issue a penalty for each violation.[124] The U.S. Coast Guard monitors and enforces the MPRSA, but individuals are empowered to bring suits against other individuals and even the U.S. government in violation of a dumping permit.[125]

However, the MPRSA's regulation does not extend to the waste associated with a ship's standard operation.[126] The EPA's analysis in granting permits is contingent upon determining that dumping will not harm, degrade, or pose a danger to the environment or human health.[127] The EPA considers a myriad of factors before issuing a permit. Such factors include the proposed quantities for dumping and whether other alternatives are available.[128]

IV. A REDUCTION IN AIR POLLUTION

Pollution control has stimulated the global economy.[129] Since the creation of the Clean Air Act in 1970, the U.S. has seen a 70% decrease in air pollution.[130] Every dollar invested in air pollution control has resulted in an average benefit of $30.[131] To keep shipping companies committed to reducing air pollution, different initiatives have been created to reward the companies that comply with the limits set to reduce pollution.[132]

A. Environmental Shipping Index

The Environmental Shipping Index (ESI) initiative started in 2011.[133] The ESI "identifies ships that perform better in reducing air emissions than what is required by standards set by the [IMO]"—

124. *Id.*
125. *Id.* at 3–4.
126. SOHN, *supra* note 118, at 391.
127. *Id.* at 391–92.
128. *Id.* at 392.
129. Landrigan, *supra* note 12, at 32.
130. *Id.*
131. *Id.* The benefit of air pollution control ranges from $4 to $88. *Id.*
132. *See infra* Section IV Parts A and B.
133. ENV'T SHIP INDEX, https://www.environmentalshipindex.org/ (last visited Nov. 23, 2022) [hereinafter ESI].

specifically evaluating nitrogen oxide and sulfur released by ships.[134] This voluntary program gives ship owners and operators incentives to follow and utilize the program appropriately.[135] The ESI is a strong indication of how sea vessels perform environmentally and identifies how ships can become cleaner; this allows members to enhance their environmental performance and reach sustainability goals.[136]

The ESI relies on the self-declaration of participating ships and ports, and it is unnecessary to provide verified information regarding nitrogen oxide, sulfur oxide, carbon dioxide, and other particulate matter emissions from ships.[137] However, data may be subjected to random verification procedures.[138] As of July 2022, only three ports in the U.S. participate in the program: the Port of Los Angeles, the Port of Long Beach, and the Port Authority of New York and New Jersey.[139] While the ESI claims to be a significant marker of how sea vessels perform environmentally, the central focus is reducing air emissions.[140] Although this initiative is undoubtedly essential and should be celebrated, it warrants concern about the lack of attention being paid to the ocean's health.

B. Green Ship and Green Flag Programs

The Port of Long Beach has started the Green Ship and Green Flag Incentive Program. The Green Ship Program was established to encourage "shipping lines to send their newest, cleanest oceangoing vessels" to the port to help improve air quality.[141] As of 2020, the port

134. *Id. See also* ENV'T SHIP INDEX, *General Information*, https://www.environmentalshipindex.org/ (last visited Nov. 23, 2022) [hereinafter ESI *General Information*].

135. ESI *General Information*, *supra* note 134.

136. *Id.*

137. *Id.*

138. *Id.*

139. ESI, *supra* note 133. These are just three of the dozens of ports located in the U.S.

140. *Id.*

141. PORT OF LONG BEACH, *Port of Long Beach Increases Green Ship Incentive*, POLB (May 26, 2021), https://polb.com/port-info/news-and-press/port-of-long-beach-increases-green-ship-incentive-05-26-2021/.

paid more than $1.7 million to program participants.[142] The port believes the incentive program will give shipping companies more of a reason to invest in cleaner ships to further improve the air quality.[143] To participate in the program, ship operators simply register for the program and shortly begin receiving the benefits.[144] The program allows ships to receive up to $9,000 per port call,[145] intending to reduce nitrogen oxide ship emissions by 2,700 tons annually.[146]

The Green Flag Program rewards ships for slowing down to twelve knots within forty miles of the harbor entrance. This constitutes an effort to reduce ship emissions of smog and diesel material.[147] Ships that consistently slow down within the set range enjoy reduced dockage fees.[148] Reducing the speed of cargo ships can lower the emission of greenhouse gasses by 45,000 tons a year and prevent 1,000 tons of general air pollutants per year.[149]

It is encouraging that the port has seen over ninety percent compliance by ships within its forty-nautical mile radius.[150] These voluntary programs provide another way to motivate shipping companies to reduce air emissions. Undoubtedly, a reduction in docking prices is attractive to many shipping companies. Still, often when one envi-

142. *Id.*

143. *Id.*

144. PORT OF LONG BEACH, *The Port of Long Beach Green Ship Award Program*, AM. ASS'N PORT AUTH., https://www.aapa-ports.org/files/Green%20Ship%20Flier.pdf (last visited Apr. 09, 2023) [hereinafter *Green Ship Award Program*].

145. PORT OF LONG BEACH*, Participate in the Green Flag Program*, POLB, https://polb.com/business/incentives/#green-flag-program (last visited Apr. 09, 2023) [hereinafter *Green Flag Program*]; PORT OF LONG BEACH, *The Green Flag Incentive Program Fact Sheet,* https://polb.com/business/incentives/#green-ship-program (last visited Apr. 09, 2023).

146. *Green Ship Award Program*, *supra* note 144.

147. *Green Flag Program*, *supra* note 145.

148. *Id.* Ships can receive a 25% reduction in docking fees by slowing down to twelve knots within forty nautical miles from the Port or a 15% reduction for slowing down within twenty nautical miles. *Id.*

149. *Port of Long Beach Green Flag Program Rewards Ocean Carriers*, PORT NEWS: STEERING IN INFORMATION WAVES! (June 29, 2019, 12:36 PM), https://en.portnews.ru/news/279390/.

150. *Green Flag Program*, *supra* note 145. The Port of Los Angeles has a similar speed reduction program, however, the incentives for compliance differ. *Id.*

ronmental stressor is reduced, other environmental pollutants increase.[151]

V. HOW TO ENCOURAGE A REDUCTION IN WATER POLLUTION

In light of the previous discussion, it is apparent that the pollution issue is not the result of a lack of willpower or motivation. On the contrary, such motivation is evident in the creation of MARPOL, the CWA, and the MPRSA. The underlying issue is that there is no straightforward way to invoke the necessary change needed to safeguard the ocean. Implementing programs that promote a reduction in air pollution, like the ESI and Green Ship and Flag programs, proves that smaller entities can have a powerful environmental impact. Still, it is integral to approach the issue of ocean pollution with the same vigor.

It is reasonable to question whether ocean reduction efforts would result in other pollution and thus confine us to a vicious cycle of action followed by more pollution. However, the possibility that efforts to safeguard the ocean may result in pollution elsewhere does not mean that the world should abandon efforts to protect the ocean altogether. While the world must work together to manage the current state of the ocean and prevent further pollution damage, individual countries, companies, and consumers can take necessary steps to address their contribution and purchase goods from companies that honor efforts to prevent ocean pollution. Currently, there is no one-size-fits-all model to reduce water pollution. If implemented, these different methods must be monitored to determine the optimal approach.

A. Norway's Green Shipping Programme

Norway has established a program to become the world's most efficient and environmentally friendly shipping country.[152] The Green Shipping Programme (GSP) comprises over 100 private companies, organizations, and governmental entities and is funded by both public

151. COMER, *supra* note 14, at 3.

152. *The World's Most Efficient and Environmentally Friendly Shipping*, GREEN SHIPPING PROGRAMME, https://greenshippingprogramme.com/about-green-shipping-programme/ (last visited Nov. 23, 2022) [hereinafter GREEN SHIPPING PROGRAMME].

and private parties.[153] In addition to the IMO's emission reduction goal (to halve shipping emissions by 2050), Norway set its own emission goals: to reduce greenhouse gas emissions from domestic shipping and fishing by 50% by 2030.[154] In order to meet this goal, GSP calculated that ships from all categories must have either low or zero emissions by 2030.[155] Through a series of different phases within the program, Norway has both set and reached new goals toward reducing emissions.[156] These phases range from merely assessing the emissions and potential reduction efforts to piloting alternative green programs that draw attention to environmental initiatives.[157] Accordingly, Norway illustrates how consolidated efforts can ultimately result in tangible steps toward safeguarding the ocean.

B. Greener Ships

When a ship travels between two countries, the emissions produced are the responsibility of the IMO.[158] The push for regulating air pollution stems from the implementation of MARPOL A-VI.[159] In 2020, the IMO banned the use of sulfur-heavy fuel oil to reduce pollutants that create smog and acid rain.[160] Greener fuel supplies have been considered, but switching to the new systems will take time. Alternative fuel options range from methanol, liquid hydrogen, ammonia,[161] and renewable energy sources—like solar, wind, and wave energy.[162]

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153. *Id.*

154. *Id.*

155. *Id.* Norway will need about 700 low-emission and 400 zero-emission ships to meet this goal. *Id.*

156. *Id.*

157. *Id.*

158. *Maritime Supply Chains: What is the Impact on Climate Change*, MARINE DIGITAL, https://marine-digital.com/article_maritime_supply_chains (last visited Nov. 23, 2022) [hereinafter *Maritime Supply Chains*].

159. COMER, *supra* note 14, at 7.

160. Stokstad, *supra* note 14.

161. Calma, *supra* note 17.

162. Linus Mofor et al., *Renewable Energy Options for Shipping: Technology Brief*, INT'L RENEWABLE ENERGY AGENCY [IRENA] 4 (Jan. 2015), https://www.irena.org/publications/2015/Feb/Renewable-Energy-Options-for-Shipping.

Unfortunately, complying with the sulfur-heavy fuel ban means paying up to fifty percent more for cleaner fuel alternatives than traditional sulfur-rich fuel.[163] However, ships can continue using the cheaper fuel if they install a scrubbing system[164] that removes the captured pollutants from the ship's exhaust.[165] While the scrubbing systems may reduce air pollution, the pollutants taken from a ship's exhaust must inevitably go somewhere. Unfortunately, far too often, the pollutants go straight into the water. The amount of "washwater" or discharge that is pumped into the ocean depends on the kind of scrubbing system that has been installed.[166] Ships equipped with scrubbers carry either an open-looped or closed-looped system. The closed-loop systems can store the captured waste until it can be disposed of on land, while open-looped scrubbers capture the sludge and release it overboard.[167] While closed-loop systems can hold much of the wastewater, they still emit some pollutants into the sea. Unfortunately, the water leaked into the ocean contains highly concentrated, contaminated pollutants that contribute to water pollution and ocean acidification.[168]

Neither system is free from flaws, but ideally, if ships must use scrubbers, closed-loop systems are the best option to hold as much of the "washwater" on board as possible. Even still, closed-loop systems have drawbacks, producing highly concentrated wastewater and creating turbid (murky) waters. Conversely, open-looped systems tend to have more of a negative impact on ocean pH.[169] Regardless of whether one scrubber system is superior, scrubbers serve as more of a workaround than a suitable mechanism to reduce emissions properly. As of May 2021, some countries have collaborated to implement a ban on scrubbers altogether.

Similarly, other countries have substantially limited scrubber discharge, by either completely prohibiting or setting limits for where

163. Stokstad, *supra* note 14.
164. *See supra* Part II.
165. *Id.*
166. COMER, *supra* note 14, at 3.
167. *Id.* at 4.
168. *Id.*
169. *Id.* at 29.

washwater can be expelled.[170] However, ultimately, the best solution is to mandate that all ships use the cleanest fuel available because all scrubbers contribute to ocean acidification regardless of the type.[171] Testing innovative fuel options is timely and expensive, but that should not deter companies from trying to improve their environmental impact. As oceanic shipping continues to increase, switching to newer, alternative fuel options will help countries keep within the IMO's current guidelines and allow them to anticipate and be better positioned for possible future changes in guidelines. Initially, when these guidelines were set, they were intended to ensure compliance and provide clarity.[172] However, it is safe to assume that the guidelines regulating scrubber systems will only continue to evolve, likely becoming more rigid, to tackle and account for emissions impact on air pollution. Eventually, a ship operating multiple scrubbers will be more expensive than taking the jump in using more environmentally friendly fuel sources.[173] Therefore, shipping companies should transition to greener fuel sources in order to get ahead of future regulations.

C. Greener Companies

To be clear, the movement for greener ships should not rest solely on the government. Various industries and consumer behavior must change. Specifically, industries must alter their manufacturing practices, and consumers must adjust their consumption habits. Such measures ensure "[a] cleaner ocean with reduced pollution."[174] Indeed, consumers have considerable influence when they voice their concerns about company behaviors that harm the environment and human health. Companies typically respond to this type of feedback to avoid the risk of losing loyal customer bases and the corresponding profit. Today's technology enables consumers to quickly become informed about companies' environmental practices. Thus, customers can reference various news sources and monitor the environmental harm unfolding at the hands of corporations, and in turn, they can vo-

170. COMER, *supra* note 14, at 5.

171. Stokstad, *supra* note 14; COMER, *supra* note 14, at 29.

172. COMER, *supra* note 14, at 30.

173. Christer Ågren. *Environmental Impacts of Ship Scrubbers*, ACID NEWS (Oct. 2019), https://www.airclim.org/acidnews/environmental-impacts-ship-scrubbers.

174. Willis, *supra* note 32, at 153.

calize their disapproval instantly. When consumers demand environmentally friendly company practices, businesses are motivated to seek out environmentally safe transporters to get their products to consumers.[175] For example, climate-conscious companies like Amazon, Patagonia, and Ikea have committed to using zero-carbon fuel ships.[176] Given the demand for products from these major companies, a push for greener modes of transportation is inevitable.[177] In pushing retailers to curb their pollutant emissions, they must look at all levels of the supply chain—including the ships they use.

Maersk, one of the world's largest shipping companies,[178] has worked on creating the world's first ship that does not generate or add more carbon dioxide to the environment. However, in response to consumer demand, they have had to significantly speed up their production timeline.[179] As a result, Maersk is working towards a fleet of these carbon-neutral ships to appease consumers and retailers and meet international emissions goals.[180] The commitment to using ships that utilize zero-carbon fuel requires the selected ships to utilize cleaner fuel. Regular fuel generally accounts for at least fifty percent of shipping costs.[181] Given the high price of shipping and fuel, it is understandable why ships might not prioritize using the more expensive, zero-carbon, greener fuels. Nevertheless, the maritime industry will have to make sacrifices to keep up with consumer demands for greener companies. Given the sheer volume of trade that occurs through ocean routes, the shipping industry's carbon footprint plays a significant role in the aim for a cleaner world.

175. Calma, *supra* note 17.

176. *Maritime Supply Chains*, *supra* note 158.

177. Companies looking to reduce their environmental impact turn to ocean shipping, as it is the friendliest (to the environment) option; admittedly, ships emit significantly fewer emissions than planes, but just because they are "better" for the environment, it does not mean ships do not have any impact at all. *Green-tech in Shipping Industry*, MARINE DIGITAL, https://marine-digital.com/article_green_ship (last visited Apr. 24, 2023) [hereinafter *Green-tech in Shipping*].

178. GEORGE, *supra* note 2, at 3.

179. Calma, *supra* note 17.

180. *Id.*

181. *Green-tech in Shipping*, *supra* note 177.

D. Water Pollution Prevention Programs

While companies and consumers can significantly impact shipping companies implementing cleaner transportation, the burden of inspiring change does not rest with companies and consumers alone. Policymakers and the public must collaborate to prevent ocean pollution and ensure the ocean remains clean and viable for human life.[182] Currently, domestic and international efforts appear to be predominantly concerned with air pollution. While limiting air pollution is undoubtedly an essential goal, we must also remember the resources we are gifted with from the ocean. The easiest way for ships to reduce air pollution is to increase their pollutant waste that ends up in the water.[183] Air pollution reduction incentive programs are a great start in getting ships and ports involved in bettering their environmental impact. However, actions must be taken to ensure water pollution is still being considered in the process of ships becoming greener. While the impacts of water pollution are less visible to the general public than how visible air pollution is to most, the severity and critical importance of water pollution is no less impactful.

There have been great strides with air quality programs resulting in a significant decrease in air pollution.[184] The reduction in air pollution is proof that incentives seem to work. Like the Green Ship Incentive that the Port of Long Beach has created to help reduce air pollution, ports can create similar, if not the same, incentives for water pollution. Though programs have been set up to regulate the discharge of water pollutants, finding programs that incentivize ships and ports to eliminate these emissions can be challenging. It is important to note that limiting how much a ship can discharge pollutants is distinct from incentivizing ships to create less waste. Limitations place the burden upon shipping companies to ensure that they comply with the guidelines. In contrast, incentives empower ships to take some initiative and reconsider their environmental philosophies. Determining the most effective incentive program will be contingent upon the response from ports and companies.

182. Landrigan, *supra* note 12, at 36.
183. COMER, *supra* note 14, at 3.
184. *Id.* at 2.

The U.S. government should take steps to encourage companies to join incentive programs; accordingly, the government should incorporate incentives within the CWA, MARPOL, and MPRSA. Companies should also be tasked with and encouraged to create additional programs to help them contribute to cleaning the water. In addition, the international community—governments, organizations, and the general public alike—should take steps to encourage action on behalf of shipping companies toward a greener footprint. Participation in the ESI and Green Ship Incentive suggests that similar approaches can be successful in the context of water pollution. However, the state of the ocean underscores that penalties[185] alone are not enough—more must be done.

Generally, people respond better to rewards and recognition for positive actions than to penalties and punishments for misconduct.[186] This is not to say that penalties in this context are entirely ineffective. In fact, fines for violations or missing regulation benchmarks, may serve as a robust monetary incentive for companies trying to become more environmentally conscious. Given the cost of shipping overall, incentive programs reducing port and dockage fees could work to mitigate water pollution. By adopting reward programs for greener practices, we can influence shipping companies to adopt more environmentally friendly technologies. Moreover, such programs follow the model of air pollution reduction incentives—by incentivizing retailers via tax breaks or rewarding shipping companies with monetary benefits. Such actions have the potential to prompt meaningful change and improve the health of the ocean.

CONCLUSION

While there is not a single method to eliminate the air and water pollution emerging from the shipping industry, there are meaningful steps to mitigate the impact of this pollution. Continuing initiatives to reduce air pollution are undoubtedly important, but a similar, concerted effort should be undertaken to safeguard the ocean. Otherwise, the

185. *See supra* Part III Section C.

186. *See generally e.g.,*Tali Sharot, *What Motivates Employees More: Rewards or Punishments?,* HARV. BUS. REV. (Sept. 26, 2017) available at https://hbr.org/2017/09/what-motivates-employees-more-rewards-or-punishments (exploring the concept of rewards and pushiments as motivators in the business context).

ocean becomes susceptible to the adverse consequences of efforts solely based on reducing air pollution. Indeed, the consequences are visible because the waste water is released into the ocean. A polluted ocean means an unhealthy environment for the photosynthetic organisms that create the air humans breathe. Thus, environmentalists must address this challenging dilemma and begs the question—are incentives prioritizing air pollution that, in turn, pollute the ocean beneficial when the ocean is the very source that facilitates the creation of the oxygen we need?

The viability of Norway's program shows that it is possible to develop programs that lead to cleaner ships, resulting in cleaner oceans. For this to work, countries and their companies must be committed to setting and implementing sustainable goals achievable in the present and the future. Norway's success rests on the fact that the country and its companies remain dedicated to their pledge of becoming the most environmentally friendly shipping country.[187] Consumer demand, which influences retailer demand, can urge shipping companies to work harder in developing and using cleaner fuels. Consumers' buying power has an incredible impact on companies, which can prompt their need for greener companies. There is no question that the ocean is vitally connected to how our world works; therefore, it requires as much emphasis on protecting its health as protecting the air. Unfortunately, it is too soon to determine which method used to address and prevent pollution will work. Nevertheless, the world cannot turn a blind eye to the growing problem of ocean pollution. Continuing to pollute the ocean will continue to damage human health and the marine ecosystem, negatively impacting the global economy and the future of maritime transportation.

187. *See* GREEN SHIPPING PROGRAMME, *supra* note 152.