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Environmental Law and Policy to Control Marine Invasive Species: The Potential Role of Environmental Impact Assessment for Enforcing the Law of the Sea in Brazil

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ABSTRACT

As transportation of cargo by ships constitutes ninety-five percent of all international trade, several negative externalities on marine pollution from those activities remain only poorly addressed. One of the most critical challenges of marine pollution has been the problem posed by marine invasive species transported by ships' ballast water. To tackle this issue, the International Maritime Organization approved an international convention called the International Convention for the Control and Management of Ships' Ballast Water and Sediments, which entered into force globally on September 9, 2017, and offers technical guidance to vessels on exchanges or performance standards for ballast water treatment. Besides scientific debates on the technical justifications for those solutions, a major difficulty is the actual enforcement of the IMO Convention rules, mostly based on formal checks on paper registries by coastal authorities, keeping the issue of ballast water management largely unsolved. Intriguingly, however, the same IMO Convention directs states parties to install waste reception facilities into their ports where ships could dump their tank sediments and ballast water instead of discharging them into the ocean or coastal areas. By doing so, most of the risks linked to marine invasive species from ballast water would be drastically reduced. Then, for countries with strong environmental policies and effective environmental impact assessments for infrastructure projects, such as Brazil, the regulatory architecture is already available to enforce those international rules on reception facilities in ports and might be highly useful to implement that unusually clear international rule.

INTRODUCTION

Golden mussel and sun coral are both exotic species recently introduced into the Brazilian aquatic ecosystems (freshwater and marine environments, respectively).[1] While the latter has been found in coastal areas and linked to direct threats to native coral reefs and their local ecosystems, the former has been dynamically expanding its presence through the Brazilian rivers with a real chance of reaching the Amazon River soon.[2] The likely common cause for both natural events has been the ballast water released by shipping trade in Brazilian ports.[3] Still, this is not a problem limited to Brazil. Golden mussels and sun coral are just a few examples of a global pattern from modern maritime practices that poses a major threat to the marine and coastal biodiversity around the world,[4] with meaningful impacts on the economy as well.[5]

Examples of marine invasive species that have caused significant ecological and economic impacts in other parts of the world include the zebra mussel (Dreissena polymorpha) and the comb jellyfish (Mnemiopsis leidyi).[6] The freshwater zebra mussel, native to Europe, has become a prolific invader, spreading to the United States by ballast water exchanges and now found throughout the waterways of North America. The North American comb jellyfish was introduced into the Black Sea through ship ballast water in the early 1980s,[7] threatening the area's anchovy fishery and causing annual losses of at least

1 For official reports by Brazilian authorities on those invasive species, see GRUPO DE TRABALHO CORAL SOL: RELATÓRIO FINAL, MINISTÉRIO DA CIÊNCIA, TECNOLOGIA, INOVAÇÕES E COMUNICAÇÕES (2017), https://antigo.mctic.gov.br/mctic/export/sites/institucional/arquivos/ASCOM_PUBLICACOES/coral_sol.pdf [https://perma.cc/FL9F-2A2P]; *Mexilhão-dourado*, IBAMA (Nov. 23, 2016), http://www.ibama.gov.br/especies-exoticas-invasoras/mexilhao-dourado [https://perma.cc/SLQ7-QXWH].

2 GRUPO DE TRABALHO CORAL SOL: RELATÓRIO FINAL, *supra* note 1; *Mexilhão-dourado*, *supra* note 1.

3 GRUPO DE TRABALHO CORAL SOL: RELATÓRIO FINAL, *supra* note 1; *Mexilhão-dourado*, *supra* note 1.

4 Int'l Union for Conservation of Nature [IUCN], *Marine Menace: Alien Invasive Species in the Marine Environment* (2021), https://www.iucn.org/downloads/marine_menace_en_1.pdf [https://perma.cc/CP8G-Z5RY].

5 The estimate is that non-native species invasions in the United States, United Kingdom, Australia, South Africa, India, and Brazil are causing more than $314 billion per year in damages. *See* David Pimentel et al., *Economic and Environmental Threats of Alien Plant, Animal, and Microbe Invasions*, 84 AGRIC., ECOSYSTEMS & ENV'T 1, 1–20 (2001).

6 Int'l Union for Conservation of Nature, *supra* note 4.

7 Vladimir P. Ivanov et al., *Invasion of the Caspian Sea by the Comb Jellyfish Mnemiopsis Leidyi (Ctenophora)*, 2 BIOLOGICAL INVASIONS 255 (2000).

US$240 million due to drops in commercial catches of marketable fish.[8]

Reduction in biodiversity caused by invasive species related to human activities has been a major source of concern for environmental authorities and organizations all around the world. In the guidelines to prevent the introduction of invasive species, the International Union for Conservation of Nature (IUCN) concludes that

> [t]he globalisation and growth in the volume of trade and tourism, coupled with the emphasis on free trade, provide more opportunities than ever before for species to be spread accidentally or deliberately. . . . Customs and quarantine practices, developed in an earlier time to guard against human and economic diseases and pests, are often inadequate safeguards against species that threaten native biodiversity. Thus the inadvertent ending of millions of years of biological isolation has created major ongoing problems that affect developed and developing countries.[9]

Ballast water transfer associated with large ships is commonly believed to be the main vector for the spread of marine invasive species, and shipping routes have been deemed special triggers for spreading marine invasive species.[10] Relatively recent changes in the shipping industry caused by the replacement of water ballast (instead of solid ballast) in ships have triggered new conditions for the spreading of marine invasive species.[11] The all but complete shift to ballast water for large ships since the 1950s[12] means that large volumes of water are carried by the world shipping fleet daily,[13] with nearly 7,000 species estimated to be in transit around the world through ballast water.[14] Between the 1970s and 2000s, shipping trade amount more than doubled from 2,490 million tonnes to 5,330 million tonnes,[15] and now more than 45,000 vessels are registered for ship trade around the

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8 J. TAMELANDER ET AL., INT'L MAR. ORG., GUIDELINES FOR DEVELOPMENT OF A NATIONAL BALLAST WATER MANAGEMENT STRATEGY 2 (2010).

9 *See* Int'l Union for Conservation of Nature [IUCN], *IUCN Guidelines for the Prevention of Biodiversity Loss Caused by Alien Invasive Species* (2000), https://portals.iucn.org/library/efiles/documents/Rep-2000-052.pdf [https://perma.cc/UCQ5-LW2M].

10 Int'l Union for Conservation of Nature, *supra* note 4.

11 DAVID MATEJ & STEPHAN GOLLASCH, GLOBAL MARITIME TRANSPORT AND BALLAST WATER MANAGEMENT (2015).

12 Int'l Union for Conservation of Nature, *supra* note 4.

13 *Id.*

14 *Id.* at 3.

15 Nicholas Bax et al., *Marine Invasion Alien Species: A Threat to Global Biodiversity*, 27 MARINE POL'Y 313, 314 (2003).

world.[16] As the cleaning conditions for ballast water have been improved and ships' speed has increased over time (reducing the total time of travel by ship), these recent updates have created better conditions for marine organisms to survive long travels around the globe and hence migrate to different regions in ballast tanks.

I
A BRIEF TALE OF INTERNATIONAL CONCERNS ON BALLAST WATER AND INVASIVE SPECIES

Although the current scenario of intensive use of ballast water and all related environmental concerns biodiversity patterns, the interest in managing ballast water management is not recent. During the 1980s, the problem was addressed by the International Joint Commission on the Pollution of Boundary Waters concerning the discharge of ballast water in the Great Lakes.[17] After years of general inaction on policies to tackle the problem, concerns about the 1980's invasion of Japanese dinoflagellates (causing harmful algal blooms) in Australia and of zebra and quagga mussels in the United States and Canada (with important economic and ecological impacts), led the International Maritime Organization (IMO) to take seriously the invasion of alien species transported in ballast water.[18]

Canada and Australia were among the first countries to experience particular problems with harmful aquatic species, and they brought their concerns to the attention of IMO's Marine Environment Protection Committee (MEPC) in the late 1980s.[19] Shortly thereafter, the United Nations Conference on Environment and Development (UNCED), held in Rio de Janeiro in 1992,[20] recognized the issue of invasive species as a major international concern. In 1997, the MEPC

16 Samrat Ghosh & Christopher Rubly, *Ballast Water Management: Challenges for the Flag State and Port State Control*, 17 INT'L ASS'N MAR. UNIVS. 372 (2016).

17 ALAN K. TAN, VESSEL-SOURCE MARINE POLLUTION: THE LAW AND POLITICS OF INTERNATIONAL REGULATION 169 (2005).

18 *Id.*

19 *Id.*

20 Article 8(h) of the Convention on Biological Preservation, approved at the UN Conference on the Environment and Development in Rio de Janeiro in 1992, states, "Prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species." The full text of the Convention is available at *Text of the Convention*, CONVENTION ON BIOLOGICAL DIVERSITY, https://www.cbd.int/convention/text/ [https://perma.cc/64SC-ZXGK] (last visited Feb. 3, 2022).

adopted guidelines to address the problem in the form of "Guidelines for the Control and Management of Ships' Ballast Water to Minimize the Transfer of Harmful Aquatic Organisms and Pathogens" (MEPC resolution A.868(20)).[21]

To address the marine invasive species problem, two major policy strategies have arisen in the global context to deal with the ballast water problem. One is the IMO endeavor to concert an international agreement that covers all relevant maritime markets in the world.[22] Headquartered in London, England, IMO has achieved the signature of an international convention on the subject in 2004, called the International Convention for the Control and Management of Ships' Ballast Water and Sediments.[23] The Convention strategy is based on two steps. The first one is a transitional period by which vessels should use ballast water exchange methods in mid-ocean (beyond national oceans limits), called D-1 standard, as a way to reduce the quantity of organisms from coastal areas carried by ballast water.[24] The subsequent step deals with numeric standards of organisms detected in ballast water (called D-2 standard).[25] This latter step focuses on water quality and performance results in organisms carried by ballast water rather than procedural approaches in the mid-ocean.

The same IMO Convention on Ballast Water has a core provision on mandating states parties to install port waste reception facilities with the capacity to treat ballast water as an alternative strategy to those exchange and performance standards.[26] Indeed, ports could play a

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21 Int'l Mar. Org. [IMO], *Guidelines for the Control and Management of Ships' Ballast Water to Minimize the Transfer of Harmful Aquatic Organisms and Pathogens*, A 20/Res. 868 (Nov. 27, 1997), https://wwwcdn.imo.org/localresources/en/KnowledgeCentre/IndexofIMOResolutions/AssemblyDocuments/A.868(20).pdf [https://perma.cc/XV9M-A3BR].

22 TAN, *supra* note 17, at 171.

23 Int'l Mar. Org. [IMO], *International Convention for the Control and Management of Ships' Ballast Water and Sediments*, BMW/CONF/36 (Feb. 16, 2004), http://library.arcticportal.org/1913/1/International%20Convention%20for%20the%20Control%20and%20Management%20of%20Ships%27%20Ballast%20Water%20and%20Sediments.pdf [https://perma.cc/T5PZ-FYJ4].

24 *Id.* at Regulation B-3.

25 *Id.*

26 *Id.* Article 5, titled Sediment Reception Facilities, states:

> Each Party undertakes to ensure that, in ports and terminals designated by that Party where cleaning or repair of ballast tanks occurs, adequate facilities are provided for the reception of Sediments, taking into account the Guidelines developed by the Organization. Such reception facilities shall operate without causing undue delay to ships and shall provide for the safe disposal of such Sediments that does not impair or damage their environment, human health, property or resources or those of other States.

decisive role in reducing the risks posed by marine invasive species in ballast water because if the world lacks appropriate technology or effective capacity for monitoring and making sure that ships do not transport marine invasive species, the strategic position of ports as the main spots for departures and arrivals for ships makes them natural targets of regulatory strategies concerned with that issue.

However, as international law always depends on national interests for the enforcement of its transnational rules,[27] the IMO Convention provisions on port reception facilities remain largely unenforced, particularly by emerging economies.[28] In Brazil, for instance, there is no public data on ports treatment facilities, which leaves port authorities to bet on poorly monitored techniques of ballast water exchanges on the high seas as provided by the IMO Convention on Ballast Water. Yet, perhaps environmental law and policy in Brazil might offer a powerful regulatory tool to influence port projects on building those treatment facilities. The environmental impact assessment, which is mandatory according to the Brazilian constitution and environmental regulations for all infrastructure projects (including ports) with significant environmental impact, is discussed later in this Article.

Accordingly, the main purpose of this Article is to answer the following question: is there any room for regulatory strategies, based on environmental impact assessments in Brazil, to influence the implementation of the IMO Convention on Ballast Water rules on port reception facilities, which could meaningfully reduce the risks of marine invasive species from ballast water? After all, port reception facilities might be considered important places for international shipping, providing safe and appropriate onshore installations to collect waste from vessels and to clean their oil tanks, among other functions.

To achieve the most appropriate response to the question above, this Article will analyze the Brazilian regulatory framework for environmental impact assessment and investigate how this approach could improve the current conditions to enforce international rules dealing with marine invasive species in that country. As discussed later in this Article, environmental impact assessments have the potential to influence and control the impacts of infrastructure projects such as

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27 *See generally* JACK L. GOLDSMITH & ERIC A. POSNER, THE LIMITS OF INTERNATIONAL LAW (2005).

28 TAN, *supra* note 17, at 253.

roads, trails, airports, and ports. Then, by imposing environmental conditions on companies and government authorities responsible for infrastructure projects, better management of environmental impact assessments could be a valuable strategy to tackle the problem posed by international shipping and ballast water.

Ultimately, the goal of this Article is to present a conclusive legal analysis that might contribute to the improvement of environmental law and policy dealing with invasive alien species triggered by ballast water in Brazil, as well as offering a potential regulatory model for other countries dealing with hardships for enforcing the Law of the Sea provisions on port reception facilities.

II
THE ENVIRONMENTAL CHALLENGES POSED BY MARINE INVASIVE SPECIES IN BALLAST WATER

Invasive species do not only become part of a local environment. They change some or most of its ecological functions. Once an alien species enters another ecosystem and becomes an invasive one, it will probably stay there for an undetermined time, and, once installed, it is very unlikely for those involved (official authorities, companies, or communities) to create a solution to remedy this problem.[29] Further, there is the "invasional meltdown" phenomenon, which occurs when a changed environment caused by an invasive species increases the vulnerability of the environment to invasion by other alien species.[30] Unlike oil spills and their environmental impact in limited space and time, the invasive species problem gets increasingly worse as time goes on.[31]

It is largely known that ballast water has been considered a fundamental technique for the stability and safe operation of ships.[32] The recurrent introduction and discharge of ocean water collected from different coastal ecosystems has been considered a regular practice adopted by vessel operators at least since the creation of steel-hulled vessels about 120 years ago.[33] The problem is that usually those coastal

29 Jeff McNeely, *Invasive Species: A Costly Catastrophe for Native Biodiversity*, 2 LAND USE & WATER RES. RSCH. 1 (2001).

30 Dennis J. O'Dowd, Peter T. Green & P.S. Lake, *Invasional 'Meltdown' on an Oceanic Island*, 6 ECOLOGY LETTERS 812 (2003).

31 *Id.*

32 MATEJ & GOLLASCH, *supra* note 11, at 13–34.

33 Peter Thompson, *Selection and Firm Survival: Evidence from the Shipbuilding Industry, 1825–1914*, 87 REV. ECON. & STAT. 26 (2005).

waters introduced into ballast tanks carry microorganisms of plant and animal species that, when released into different ecosystems, might become potential invaders, killing previous local marine and coastal species.[34]

The current level of international trade by shipping transportation of commodities has been the most important source of invasive alien species into coastal ecosystems, either by hull fouling or ballast water.[35] Accordingly, that dynamic imposes challenging social and economic impacts on human health and commercial activities based on coastal marine resources such as fisheries, tourism, and aquaculture, all of which are threatened by those ecological disruptions.[36]

Within the larger framework of invasive species caused by human activities, the invasion of alien species through ballast water in ships is currently one of the major threats to biodiversity in the world.[37] The end of the Middle Ages and the beginning of the European expansion to the New World led to important changes in social and economic patterns such as human demography, agriculture, trade, and industry, and ships were crucial for that European expansion as the major transoceanic link between Europe and Americas during the period of expansion.[38] But a later historical moment had a significant role in changing global trade and biological exchange, leading to the world's current stage of biodiversity threat caused by ecological dysfunctions prompted by invasive species: the Industrial Revolution. This crucial historical event triggered significant increases and changes in international trade through more efficient ships and the construction of new canals, roads, and railways. That increase in trade also led to increased biological exchange, meaning the Industrial Revolution might have been a significant contributor to ecological destabilization and threatened biodiversity in the present day.[39]

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34 Int'l Union for Conservation of Nature, *supra* note 4.

35 Reuben P. Keller et al., *Linking Environmental Conditions and Ship Movements to Estimate Invasive Species Transport Across the Global Shipping Network*, 17 DIVERSITY & DISTRIB. 93 (2011).

36 Int'l Union for Conservation of Nature, *supra* note 4.

37 Sarah A. Bailey, *An Overview of Thirty Years of Research on Ballast Water as a Vector for Aquatic Invasive Species to Freshwater and Marine Environments*, 18 AQUATIC ECOSYSTEM HEALTH & MGMT. 261 (2015).

38 For an overview on the human history of the oceans, see DAVID ABULAFIA, THE BOUNDLESS SEA: A HUMAN HISTORY OF THE OCEANS (2019).

39 Philip E. Hulme, *Trade, Transport and Trouble: Managing Invasive Species Pathways in an Era of Globalization*, 46 J. APPLIED ECOLOGY 10, 10–18 (2009).

Another historical time with meaningful impacts on spreading marine alien species has been taking place due to the massive use of shipping containers since the 1960s.[40] Containers considerably improved the transport capacity of goods by ships but,[41] at the same time, increased the demands for vessel safety to support this new huge weight. To deal with these new safety standards, ballast water has become a fundamental technique to guarantee ship stability in a flexible way.[42] Ballast water levels can be increased or reduced several times during a maritime voyage according to the safety needs of the vessel, and as containers interfere decisively with vessel weight, their loading procedures influence the use of ballast water.[43]

For increasingly connected global marketplaces, maritime trade is likely to continue increasing its sheer volume and the use of ballast water. Indeed, the environmental problems posed by ballast water could be considered proportional to its relevance for the global maritime trade.

The scientific complexity of the ballast water problem for the environment is aggravated by the significant variation that may exist in the features of biota transported in ballast water from different source regions.[44] It has been suggested, for example, that biota from some geographic regions may be a more successful invasive species due to its competitive superiority or characteristics, as the particular history of a given species also can explain its strengths and weaknesses.[45] Thus, it seems appropriate to say that this level of information should be part of any risk analysis policy and regulation in dealing with the ballast water problem.

A practical difficulty involved in ballast water threats to marine biodiversity is that living organisms collected from ballast water exchanged in the mid-ocean range from fishes down to microorganisms.[46] Over fifteen animal phyla have been detected in ballast water, especially mollusks, crustaceans, worms, hydromedusae, and flatworms, but also algae, seagrasses, viruses, and bacteria.[47] This

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40 Seymour Simon, *The Law of Shipping Containers*, 5 J. MAR. L. & COM. 507 (1973).

41 Hulme, *supra* note 39.

42 *Id.*

43 *Id.*

44 H. Seebens et al., *The Risk of Marine Bioinvasion Caused by Global Shipping*, 16 ECOLOGY LETTERS 782 (2013).

45 *Id.*

46 Int'l Union for Conservation of Nature, *supra* note 4.

47 *Id.*

massive transport of microorganisms imposes seemingly insurmountable challenges to coastal states and creates serious doubts on the effectiveness of regulatory strategies based on exchange or performance standards.

Moreover, the problem posed by marine invasive species should not be considered without acknowledging the broader context of global biodiversity loss in the Anthropocene and climate change age.[48] As coastal ecosystems provide critical habitats for many marine species,[49] the replacement of native species by invasive ones usually affects most of the natural relationships occurring in that environment, imposing even more pressure on those ecosystems already under increasingly new climate conditions posed by global warming.

As it happens in other countries that deal with marine invasive species, the alien species golden mussels and sun coral have triggered ecological disruptions along Brazilian rivers and shorelines.[50] Recently, several hydroelectric power facilities located in the economically powerful state of São Paulo supported increased costs for the management of golden mussels encrusted in its turbines.[51] Sun coral invasion along the Brazilian coast, in turn, seemingly reduced fishing stocks in the state of Bahia and keeps expanding its presence northward toward high tourism beaches in the Northeast.[52] Further, new economic projects for exploring oil and gas (bringing ports and tankers to transport them) at the mouth of the Amazon River (a large swath of water area connecting the river and the Atlantic Ocean) pose meaningful concerns on the likely introduction of marine invasive species into the highly biodiverse aquatic ecosystems of the Amazon rainforest.[53]

Considering the global scale of the problem posed by ballast water and invasive species, the next Part will then discuss international

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48 Harold Mooney et al., *Biodiversity, Climate Change, and Ecosystem Services*, CURRENT OP. ENV'T SUSTAINABILITY 46 (2009).

49 Coral reefs, for example, provide essential habitat for fish reproduction and early development. *See* Walter C. Jaap, *Coral Reef Restoration*, 15 ECOLOGICAL ENG'G 345 (2000).

50 GRUPO DE TRABALHO CORAL SOL: RELATÓRIO FINAL, *supra* note 1; *Mexilhão-dourado*, *supra* note 1.

51 *Id.*

52 *Id.*

53 Marta Nogueira, *Greenpeace Says Coral at Amazon Mouth Should Bar Total Oil Drilling*, REUTERS (Apr. 16, 2018), https://www.reuters.com/article/us-greenpeace-total-amazon-idUSKBN1HN34D [https://perma.cc/5P69-WZXX].

initiatives under the Law of the Sea to tackle that issue. However, it should be noted that since the early debates in the international arena, a regulatory solution through port reception facilities and environmental impact assessments has never been privileged as part of any major policy solution to deal with the problem of international shipping and marine invasive species. This issue will be discussed in Part IV.

III
SEEKING A SOLUTION FROM THE LAW OF THE SEA: THE IMO CONVENTION ON BALLAST WATER

The main international authority that has directly addressed the problems posed by ballast water has been the International Maritime Organization (IMO), a United Nations agency for the safety and security of shipping and the prevention of maritime pollution by ships. Created in 1948 and headquartered in London, England, that organization has 164 member states, and its purpose is to create a globally adopted regulatory framework for the shipping industry.[54]

Although the IMO Convention on Ballast Water might be considered the main international regulation on ballast water and international shipping to be discussed in this Article, it is useful to understand the role of other international conventions concerning environmental pollution in the Law of the Sea. For this purpose, some major international laws such as the 1982 United Nations Convention on the Law of the Sea (UNCLOS) and the 1973 International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) are relevant for the historical context of how the ballast water environmental problem has entered and developed into the IMO regulatory agenda.

As discussed later in this Article, Brazil has ratified the IMO Convention on Ballast Water[55] and adopted a few regulatory initiatives toward the control of invasive species by ships, basically internalizing the IMO Convention on Ballast Water provisions.[56] To enforce ballast

54 TAN, *supra* note 17, at 77.

55 Int'l Mar. Org. [IMO], *Status of Conventions*, https://www.imo.org/en/About/Conventions/Pages/StatusOfConventions.aspx [https://perma.cc/MW5L-5RH3] (last visited Mar. 19, 2022).

56 MARINHA DO BRASIL DIRETORIA DE PORTOS E COSTAS, NORMA DA AUTORIDADE MARÍTIMA PARA O GERENCIAMENTO DA ÁGUA DE LASTRO DE NAVIOS: NORMAM 20/2005 (2021), https://www.marinha.mil.br/dpc/sites/www.marinha.mil.br.dpc/files/NORMAM-20_REV2_MOD1.pdf [https://perma.cc/5ZTC-B96B] [hereinafter NORMAM 20/2005].

water control in ports, the Brazilian Navy has been the central government agency, and environmental agencies have remained largely not involved.[57]

A. The Law of the Sea Background

1. UNCLOS

The United Nations Convention on the Law of the Sea (UNCLOS) was signed in 1982, has 320 articles and nine annexes, and sought to reflect the progressive development of the customary international law of the sea.[58] Among many important aspects of that Convention, the definition of ocean zones and their associated legal rights and duties has been quite useful to organize maritime trade and military operations around the world. The definitions of ocean zones such as the territorial sea, contiguous zone, exclusive economic zone (EEZ), continental shelf, and high seas have been some of the most consequential concepts consolidated by the Convention.[59]

Alien species are expressively mentioned in article 196 of the UNCLOS, which requires states to "take all measures necessary to prevent, reduce and control pollution of the marine environment resulting from the use of technologies under their jurisdiction or control, or the intentional or accidental introduction of species, alien or new, to a particular part of the marine environment, which may cause significant and harmful changes thereto."[60]

Although the ballast water-specific threats to the environment are not directly addressed by UNCLOS, concepts and baselines regulated by this Convention such as the EEZ and high seas have been largely used in practice as geographic references to meet ballast water exchange standards (with mid-ocean exchanges usually occurring in the high seas) or to give authority to states on monitoring performance standards.[61] Further, UNCLOS provides directives to countries through

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57 *Id.*

58 THE OXFORD HANDBOOK OF THE LAW OF THE SEA 24 (Donald Rothwell et al. eds., 2015).

59 *Id.* at 27.

60 United Nations Convention on the Law of the Sea, Dec. 10, 1982, 1833 U.N.T.S. 397, https://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf [https://perma.cc/V6PY-2265].

61 TAN, *supra* note 17, at 192.

mandatory legal duties to protect marine ecosystems against pollution in their territories.[62]

By 2014, UNCLOS had been ratified by 163 countries, including Brazil, Australia, and the European Union.[63] Although the United States has not been a party to the Convention, since 1994 its stated policy is to follow the UNCLOS provisions.[64] Indeed, Executive Order 13,547, signed by President Obama, established the accession to UNCLOS as a policy priority for the U.S. National Ocean Policy.[65]

2. London Convention

The London Convention was adopted in 1972[66] and addressed waste dumping in the ocean. For this purpose, the Convention created two categories of waste: black and gray. These categories are defined based on the hazard they present to the environment. Dumping black wastes, for example, is prohibited.[67] For gray materials, a special permit from the national authority is required.[68] Other wastes not listed as black or gray can be dumped after a general permit as well.[69]

3. MARPOL 73/78

The 1973 International Convention for the Prevention of Pollution from Ships (MARPOL 73) and its 1978 Protocol (MARPOL 73/78) seeks to completely eliminate the intentional pollution of the marine environment by oil and other harmful substances and to minimize the accidental discharges of such substances.[70] Approximately 152 countries have ratified this Convention, including Brazil.[71]

The Convention includes six annexes, which cover oil (Annex I), noxious liquid substances (Annex II), harmful goods in packaged form

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62 *Id.* at 145.

63 THE OXFORD HANDBOOK OF THE LAW OF THE SEA, *supra* note 58, at 33.

64 Jonathan I. Charney, Comment, *The United States and the Law of the Sea After UNCLOS III: The Impact of General International Law*, 46 L. & CONTEMP. PROBS. 37 (1983).

65 Exec. Order No. 13,547, 75 Fed. Reg. 43,201 (July 22, 2010), https://obamawhitehouse.archives.gov/the-press-office/executive-order-stewardship-ocean-our-coasts-and-great-lakes [https://perma.cc/43CE-DEQ8].

66 Michael S. Schenker, *Saving a Dying Sea—The London Convention on Ocean Dumping*, 7 CORNELL INT'L L.J. 32, 42 (1973).

67 *Id.*

68 *Id.*

69 *Id.*

70 TAN, *supra* note 17, at 126.

71 NORMAM 20/2005, *supra* note 56.

(Annex III), sewage (Annex IV), garbage (Annex V), and air pollution (Annex VI).[72] The first two annexes are mandatory for those countries that ratify the Convention.[73] Although ballast water is not included within the scope of this Convention, the Convention provides that ports should have waste reception facilities in order to avoid dumping waste into coastal marine areas.[74] As discussed later in this Article, that provision might be an important regulatory device to reduce risks triggered by ballast water mismanagement.

B. The International Convention for the Control and Management of Ships' Ballast Water and Sediments

Reacting to the problem of marine invasive species transported by ballast water, the IMO adopted the International Convention for the Control and Management of Ships' Ballast Water and Sediments in 2004.[75] After thirty countries representing thirty-five percent of the global shipping trade ratified it, including Brazil and several European Union members, this convention entered into force in September 2017.[76] The influence exercised by the Canadian and Australian governments and the International Joint Commission/Great Lakes Fishery Commission Report was particularly important for pushing the policy initiative.[77] As a result of those endeavors, the IMO created the Marine Environmental Protection Committee (MEPC) in 1997,[78] whose guidelines on ballast water management recommended ballast water exchange as a default method at that time and were adopted as Assembly Resolution A 868(20).[79]

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72 *International Convention for the Prevention of Pollution from Ships (MARPOL 73/78)*, INT'L MAR. ORG. (Sept. 6, 2021), https://www.jus.uio.no/english/services/library/treaties/06/6-05/ships-pollution.xml [https://perma.cc/QU57-QC35] [hereinafter *MARPOL 73/78*].

73 TAN, *supra* note 17, at 133.

74 *MARPOL 73/78*, *supra* note 72. Provisions on ports' reception facilities: Oily residues (from ER or from cargo): Annex I, regulation 38; NLS residues: Annex II, regulation 18; Sewage: Annex IV, regulation 12; Garbage: Annex V, regulation 7; and Annex VI wastes & residues: regulation 17.

75 TAN, *supra* note 17, at 171.

76 Int'l Mar. Org. [IMO], *Implementing the BWM Convention* (Sept. 6, 2021), https://www.imo.org/en/MediaCentre/HotTopics/Pages/Implementing-the-BWM-Convention.aspx [https://perma.cc/3C8Y-MFCR].

77 TAN, *supra* note 17, at 169.

78 *Id.*

79 S. Gollasch et al., *Critical Review of the IMO International Convention on the Management of Ships' Ballast Water and Sediments*, 6 HARMFUL ALGAE 585 (2007).

The basic structure of the IMO Convention on Ballast Water lays out several provisions with rules about legal definitions, obligations, scope, sanctions, and inspection proceedings, among others. Although the member states should establish national laws and regulations to implement the international rules, the Convention does not prevent member states from adopting different measures (if more stringent), according to Article 2(3).[80] But the IMO Convention on Ballast Water provides a few exceptions from its rules, including warships.[81] Besides its core provisions, the Convention also has a lengthy Annex (divided into five sections) concerning technical details for the convention implementation, and, apart from its mandatory rules, the IMO has adopted guidelines to implement the Convention.[82]

The two most important standards for ballast water management set out by the IMO Convention on Ballast Water can be found in its Annex. These standards are called D-1 and D-2,[83] and their implementation should take place according to a timeline that assumes the D-2 standard as the regular strategy for tackling the marine invasive species problem

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80 Int'l Mar. Org., *supra* note 23, Annex Section D states:

> Regulation D-1 Ballast Water Exchange Standard. Ships performing Ballast Water exchange in accordance with this regulation shall do so with an efficiency of at least 95 percent volumetric exchange of Ballast Water. For ships exchanging Ballast Water by the pumping-through method, pumping through three times the volume of each Ballast Water tank shall be considered to meet the standard described. Pumping through less than three times the volume may be accepted provided the ship can demonstrate that at least 95 percent volumetric exchange is met.
>
> Regulation D-2 Ballast Water Performance Standard. Ships conducting ballast water management in accordance with this regulation shall discharge less than 10 viable organisms per cubic meter greater than or equal to 50 micrometers in minimum dimension and less than 10 viable organisms per milliliter less than 50 micrometers in minimum dimension and greater than or equal to 10 micrometers in minimum dimension; and discharge of the indicator microbes shall not exceed the specified concentrations.
>
> Indicator microbes, as a human health standard, include: (a) Toxicogenic Vibrio cholerae (O1 and O139) with less than 1 colony forming unit (cfu) per 100 milliliters or less than 1 cfu per 1 gram (wet weight) zooplankton samples; (b) Escherichia coli less than 250 cfu per 100 milliliters; (c) Intestinal Enterococci less than 100 cfu per 100 milliliters.

81 Int'l Mar. Org., *supra* note 23, at art. 3(2).

82 Int'l Mar. Org. [IMO], *Guidelines and Guidance Documents Related to the Implementation of the International Convention for the Control and Management of Ships' Ballast Water and Sediments*, https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/Compilation%20of%20relevant%20Guidelines%20and%20guidance%20documents%20-%20May%202018.pdf [https://perma.cc/26UU-QA82].

83 Int'l Mar. Org., *supra* note 23.

since 2016.[84] None of them, however, are related to port reception facilities or environmental impact assessments as part of a global solution to the ballast water problem.

In general terms, the D-1 standard establishes a ballast water exchange standard with an efficiency of at least ninety-five percent volumetric exchange of ballast water,[85] which can be achieved by pumping through three times the volume of ballast water. For this purpose, the ballast water exchange should be implemented from at least 200 nautical miles from the nearest land (fifty miles in exceptional circumstances) and in water at least 200 meters in depth.[86] The D-2 standard,[87] in turn, imposes numeric limits of organisms found in the ballast water as they reach coastal states.[88]

In a nutshell, as the final deadline for general application of numeric limits (D-2 standard) expired in 2016 for all vessels (no matter if they were built before or after 2009 or 2012), the D-2 standard is the current

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84 Int'l Mar. Org., *supra* note 23. The transition schedule between the ballast water exchange standard (D-1) and the numeric limits standard (D-2) has been established in Section B(3) of the Annex, which provides:

> 1. A ship constructed before 2009:
>
> (1) with a Ballast Water Capacity of between 1,500 and 5,000 cubic metres, inclusive, shall conduct Ballast Water Management that at least meets the standard described in regulation D-1 or regulation D-2 until 2014, after which time it shall at least meet the standard described in regulation D-2;
>
> (2) with a Ballast Water Capacity of less than 1,500 or greater than 5,000 cubic metres shall conduct Ballast Water Management that at least meets the standard described in regulation D-1 or regulation D-2 until 2016, after which time it shall at least meet the standard described in regulation D-2.
>
> . . .
>
> 3. A ship constructed in or after 2009 . . . with a Ballast Water Capacity of less than 5,000 cubic metres shall conduct Ballast Water Management that at least meets the standard described in regulation D-2. . . .
>
> 4. A ship constructed in or after 2009, but before 2012, with a Ballast Water Capacity of 5,000 cubic metres or more shall conduct Ballast Water Management in accordance with paragraph 1.2.
>
> 5. A ship constructed in or after 2012 with a Ballast Water Capacity of 5000 cubic metres or more shall conduct Ballast Water Management that at least meets the standard described in regulation D-2.

85 Int'l Mar. Org., *supra* note 23.

86 *Id.* at Annex Section B-4.

87 *Id.* at Annex Section D-2.

88 Katharine J. Carney et al., *Difficulties in Obtaining Representative Samples for Compliance with the Ballast Water Management Convention*, 68 MARINE POLLUTION BULL. 99 (2013).

mandatory approach to ballast water management under the IMO Convention, though there is no official open data on its current level of implementation around the world yet.[89]

While ballast water exchange can meaningfully reduce the number of original organisms present in ballast water, there is always residual biota in this water.[90] Thus, the risk of transfer of alien species through ballast water is not eliminated by its exchange in the mid-ocean because many factors can reduce the efficiency of ballast water exchange as a means to reduce the number of potentially harmful organisms, such as types and characteristics of ships or tanks.[91]

Meanwhile, scientists have expressed concern that this approach was not appropriate to eliminate invasive species because its effectiveness varies according to vessel type (design), exchange method, ballasting system configuration, and exchange location, among others.[92] For these reasons, the U.S. Congress, the U.S. Coast Guard, the International Maritime Organization, and the U.S. National Research Council began considering ballast water treatment instead of ballast water exchange as a better long-term solution to aquatic invasive species.[93] On the other side, the shipping industry generally complains that ballast water exchange is difficult to implement and costly in terms of fuel and carbon emissions.[94]

To allow the enforcement of the IMO Convention on Ballast Water rules by coastal and flag states, each ship is required to have onboard and implement a Ballast Water Management Plan approved by the competent authority of the member state.[95] This document will be translated for the language of the ship's nationality and will contain all details about the international regulations.[96] Further, each vessel must have a Ballast Water Record Book, which will register all information about the intake, use, and discharge of water on board.[97]

The IMO Convention on Ballast Water should be viewed as a major progress in the international arena dealing with the problem of marine

89 Int'l Mar. Org., *supra* note 23.

90 Ian C. Duggan et al., *Invertebrates Associated with Residual Ballast Water and Sediments of Cargo-Carrying Ships Entering the Great Lakes*, 62 CAN. J. FISHERIES & AQUATIC SCI. 2463 (2005).

91 *Id.*

92 *Id.*

93 TAN, *supra* note 17, at 171.

94 *Id.*

95 Int'l Mar. Org., *supra* note 23, at sec. B-1.

96 *Id.*

97 *Id.*

invasive species. Because international agreements involving global trade are always difficult to negotiate and achieve common deals, the Convention has been considered a meaningful step forward and can be quite useful for reducing the environmental threats posed by ballast water discharges. But because of the weakness of the ballast water exchange strategy, much criticism has been raised against ballast water exchange,[98] and, as discussed later, further improvements should be pursued, mainly by improving domestic environmental regulatory tools in order to play a decisive role on this stage.

IV
BEYOND IMO RULES: REGULATORY FRAMEWORK ON NATIONAL LEVELS

Two important policy and legal strategies have arisen to deal with the ballast water problem related to marine invasive species: those adopted by countries aligned to the IMO approach, on one side, and rules from the federal and state governments in the United States enacting more stringent standards on the other. Although partners during all the deliberative process for the signature of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, the United States has not officially ratified this treaty yet, though policy initiatives for accession have been adopted.[99]

A. The United States

More than 90,000 commercial ships arrive every year in the United States coastal areas, and most of them come from foreign ports,[100] which reflects the magnitude of international vessel traffic and trade.[101]

One of the best-studied sites in the world is the Great Lakes, located on the border between the United States and Canada.[102] Invasive species in the Great Lakes have been documented since 1830, and more

98 Fangzhu Zhang & Mike Dickman, *Mid-Ocean Exchange of Container Vessel Ballast Water. 1: Seasonal Factors Affecting the Transport of Harmful Diatoms and Dinoflagellates*, 176 MARINE ECOLOGY PROGRESS SERIES 243, 243–44 (1999).

99 THE OXFORD HANDBOOK OF THE LAW OF THE SEA, *supra* note 58.

100 James J. Corbett et al., *The Effectiveness and Costs of Speed Reductions on Emissions from International Shipping*, TRANSP. 14 RSCH. PART D: TRANSP. & ENV'T 593 (2009).

101 Timothy T. Work et al., *Arrival Rate of Nonindigenous Insect Species into the United States Through Foreign Trade*, 7 BIOLOGICAL INVASIONS 323 (2005).

102 Christopher Costello et al., *Evaluating an Invasive Species Policy: Ballast Water Exchange in the Great Lakes*, 17 ECOLOGICAL APPLICATIONS 655 (2007).

than 180 invasive species are cataloged in that ecosystem, with an economic impact of $100 million annually.[103] Nationally speaking, the economic impact of invasive species has been estimated to be $137 billion annually.[104]

The regulatory gap between the IMO and the United States, along with individual state initiatives within the United States, has led to the development of independent policy strategies and regulatory results over time.[105] In fact, many of the provisions of the IMO Convention on Ballast Water, such as the performance standards (called D-2 standards), reflect critical input from the United States during the deliberative process at IMO.[106]

After the international negotiations around the IMO Convention on Ballast Water, the United States adopted similar rules and standards but more stringent goals. Two federal agencies have been major actors in designing the U.S. regulatory approach: the U.S. Coast Guard and the Environmental Protection Agency.[107] Under three central statutes dealing directly or indirectly with ballast water and water quality,[108] those agencies have produced regulations to address the ballast water problem through similar paths to those adopted by the IMO since the 1990s. Moreover, similar to the IMO approach, a transition period between ballast water exchange and ballast water numeric standards has been provided by federal and state regulations in the United States.

But even before the IMO Convention entered into force, regulatory initiatives had been placed in the United States. When the U.S. EPA issued its first regulations under the Clean Water Act provisions, Congress and the environmental community paid little or no attention

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103 Alex L. Rosaen et al., *The Costs of Aquatic Invasive Species to Great Lakes States*, ANDERSON ECON. GRP. 1 (2012).

104 David Pimentel et al., *Environmental and Economic Costs of Nonindigenous Species in the United States*, 50 BIOSCIENCE 53 (2000).

105 Leo Čampara et al., *Overview and Comparison of the IMO and the US Maritime Administration Ballast Water Management Regulations*, 7 J. MARINE SCI. & ENG'G 283 (2019).

106 James L. Malone, *The United States and the Law of the Sea After UNCLOS III*, 46 LAW & CONTEMP. PROBS. 29 (1983).

107 Andrew N. Cohen et al., *Revisiting the Basis for US Ballast Water Regulations*, 118 MARINE POLLUTION BULL. 348 (2017).

108 These statutes are the following: Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (called NANPCA), 16 U.S.C. §§ 4701–4751; National Invasive Species Act of 1996 (NISA), Pub. L. No. 104–332, 110 Stat. 4073 (1996); Clean Water Act, 33 U.S.C. §§ 1251–1388.

to the ballast water problem related to invasive species.[109] At that time, the U.S. EPA expressly excluded discharge incidental to the normal operation of a vessel from the permitting system set out by the Clean Water Act.[110]

In 1990, Congress sought to address the regulatory gap on ballast water with the enactment of the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (NANPCA).[111] This statute was the first national law in the world to explicitly address the problem of ballast water discharges and aquatic invasive species, but its scope was geographically limited to ship operations in the Great Lakes. NANPCA required ships to exchange ballast water in the ocean, the only method available at the time.[112]

After NANPCA, Congress enacted the National Invasive Species Act of 1996 (NISA)[113] with the purpose of reauthorizing and expanding the NANPCA program. NISA charged the U.S. Coast Guard (USCG) with the mission of issuing a national ballast water management program. As the first regulations issued by the USCG were nonmandatory (usually guidelines) to the regulated industries, their enforcement was unsatisfactory.[114] But in July 2004, the USCG issued the first mandatory regulations under NISA.[115]

In 2012, the USCG issued the current rules to ballast water management.[116] The major change has shifted from ballast water exchange toward numeric limits standards. The initially proposed numeric limits can be viewed in Table 1 and were even 100 times stricter than those established by the D-2 standards in the IMO

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109 Lisa A. Brautigam, *Control of Aquatic Nuisance Species Introductions via Ballast Water in the United States: Is the Exemption of Ballast Water Discharges from Clean Water Act Regulation a Valid Exercise of Authority by the Environmental Protection Agency?* 6 OCEAN & COASTAL L.J. 33 (2001).

110 *Id.*

111 Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, 16 U.S.C. §§ 4701–4751.

112 *Id.* § 1101(a)(1).

113 National Invasive Species Act of 1996, 16 U.S.C. §§ 4701–4751.

114 U.S. Coast Guard Mandatory Ballast Water Management Program for U.S. Waters, 33 C.F.R. § 151 (2004).

115 *Id.*

116 U.S. Coast Guard Standards for Living Organisms in Ships' Ballast Water Discharged in U.S. Waters, 33 C.F.R. § 151.513 (2012) [hereinafter U.S. Coast Guard Standards].

Convention on Ballast Water.[117] But the final rule has followed the international D-2 standards (numeric limits) as the USCG held that there was not enough scientific basis to impose stricter limits such as those in the proposed rule.[118] The final deadline to comply with this new USCG standard ended in 2016.[119] Currently, all vessels covered by the USCG regulation on ballast water must carry out its numeric limits standards.

Besides the USCG, the U.S. Environmental Protection Agency (EPA) has been another major regulator on ballast water management. Until 2008, the EPA excluded incidental discharges to the normal operation of vessels—such as ballast water exchange—from the National Pollutant Discharge Elimination System (NPDES) permitting provided by the Clean Water Act.[120] As an EPA administrator said to the court, "[V]essels were not important to the overall scheme of things at that time."[121] Only in the late 1980s, after a massive invasion of zebra mussels in the Great Lakes took the attention of Congress,[122] did ballast water management become a national priority.

But a relevant precedent from the U.S. Court of Appeals for the Ninth Circuit, *Northwest Environmental Advocates v. EPA*, changed everything.[123] The main issue the court dealt with was the interpretation of sections 301 (prohibits the discharge of pollutants) and 402 (allows the discharge of pollutants with a permit) of the Clean Water Act. The Court of Appeals concluded as follows:

> The text of the statute clearly covers the discharges at issue here. A ''discharge of any pollutant'' is ''any addition of any pollutant to navigable waters from any point source.'' 33 U.S.C. § 1362(12)(A). A ''point source'' is ''any discernable, confined and discrete

117 U.S. Coast Guard Proposed Rule on Standards for Living Organisms in Ships' Ballast Water Discharged in U.S. Waters, 33 C.F.R. § 151 (2009).

118 U.S. Coast Guard Standards, *supra* note 116.

119 *Id.*

120 Thompson, *supra* note 33.

121 *Id.*

122 Ronald W. Griffiths et al., *Distribution and Dispersal of the Zebra Mussel (Dreissena Polymorpha) in the Great Lakes Region*. 48 CANADIAN J. FISHERIES & AQUATIC SCI. 1381 (1991).

123 Nw. Env't Advocs. v. EPA, 537, 1006 (9th Cir. 2008). In *Northwest Environmental Advocates v. EPA*, the court analyzed the EPA regulation that exempted ballast water discharge under the Clean Water Act (CWA). The CWA Section 402 prohibits the discharge of any pollutant from a point source into navigable waters of the United States without a National Pollutant Discharge Elimination System (NPDES) permit. But, in 1973, the EPA issued a regulation that expanded the statutory exemption to "any other discharge incidental to the normal operation of a vessel." *Id.* at 1011. The agency justified this option by arguing that "this type of discharge generally causes little pollution." *Id.*

> conveyance, including . . . [a] vessel or other floating craft, from which pollutants are or may be discharged.'' Id. § 1362(14). ''[N]avigable waters'' are ''the waters of the United States, including the territorial seas,'' which begin near the coast and ''extend[ ] seaward a distance of three miles.'' Id. §§ 1362(7), (8). ''Pollutant'' is defined as ''dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water.'' 33 U.S.C. § 1362(6). The term ''biological materials'' includes invasive species. See, e.g., Nat'l Wildlife Fed'n v. Consumers Power Co., 862 F.2d 580, 583 (6th Cir.1988).[124]

After the judicial ruling, the first U.S. EPA regulation on discharge incidental to the normal operation of vessels, issued in 2008 (called "Vessel General Permit" or VGP),[125] covered ballast water discharge, but it did not apply to recreational vessels as defined by the Clean Water Act Section 505(25), as well as to commercial fishing vessels and non-recreational vessels under seventy-nine feet in length.[126]

In 2013, the EPA replaced the 2008 VGP with a new regulation that included commercial fishing vessels and non-recreational vessels less than and greater than seventy-nine feet in length.[127] This regulation also included any vessels as a means of transportation, including cruise ships, ferries, oil tankers, cargo ships, research vessels, and emergency response.[128]

The 2013 VGP establishes similar numeric limits for ballast water from those set out by the USCG and the IMO Convention on Ballast Water standards (D-2).[129] According to this regulation, vessels that meet these numeric standards no longer need to perform ballast water exchange.[130] Vessel owners or operators subject to the concentration-based numeric discharge limitations are able to meet these limits in one of four ways: (a) treating ballast water to meet the applicable numeric

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124 *Id.* at 1021.

125 EPA, EPA-HQ-OW-2011-0141-0949, VESSEL GENERAL PERMIT (2011), https://www.regulations.gov/document/EPA-HQ-OW-2011-0141-0949 [https://perma.cc/EW8A-T34Y] [hereinafter U.S. EPA VESSEL PERMIT].

126 *Id.*

127 *Id.*

128 *Id.*

129 *Id.*

130 *Id.*

limits of the VGP prior to discharge;[131] (b) transferring the ship's ballast water to a third party for treatment at an NPDES permitted facility;[132] (c) using treated municipal/potable water as ballast water;[133] or (d) avoiding discharges of ballast water.[134] But until vessels meet the numeric ballast water limits, the VGP imposes several best management practices based mostly on ballast water exchange.[135]

Beyond the federal regulatory framework, nine states in the United States have promulgated quite progressive regulatory programs under the Clean Water Act section 401 certification to address the ballast water problem. These include California, Oregon, Minnesota, Washington, New York, Michigan, Virginia, Wisconsin, and Hawaii.[136] California's "zero detectable" standard, for example, might be considered the most stringent approach in the world because it limits the organism content of ballast water discharges (numeric limits) to a much lower level—about 1,000 times lower for most organism types—than the discharge level established by the federal government and the Convention (D-2 standard).[137] The final deadline imposed by California for the regulated industry to comply with the "zero detectable" standard was January 2020.[138]

Table 1 on the following page compares the numeric standards established by the IMO Convention, the initially proposed USCG rule, and the California regulation.[139]

131 *Id.*

132 *Id.*

133 *Id.*

134 *Id.*

135 *Id.*

136 Amy Browning, *The Current State of Ballast Water Regulations*, 2 ENV'T & ENERGY L. & POL'Y J. 327 (2008).

137 Ryan J. Albert et al., *Ballast Water Regulations and the Move Toward Concentration-Based Numeric Discharge Limits*, 23 ECOLOGICAL APPLICATIONS 289, 295 (2013).

138 *Id.*

139 *Id.* at 292.

Table 1. *Concentration Limits for Four Organism Classes*

	Organisms ≥ 50 µm in minimum dimension	**Organisms ≥ 10 – <50 µm in minimum dimension**	**Bacteria**	**Viruses**
	per m^3	**per ml**	**per ml**	**per ml**
IMO D-2	10	10	no limit	no limit
USCG Phase 1	10	10	no limit	no limit
US Negotiating Position	0.01	0.01	no limit	no limit
USCG Phase 2	0.01	0.01	10	100
California Interim	no detectable[a]	0.01	10	100
California Final	zero detectable[b]	zero detectable	zero detectable	zero detectable

[a] For California's interim standard for organisms ≥ 50 µm, the "no detectable" standard is not associated with a volumetric requirement, i.e., the standard is not "not detectable living organisms" per cubic meter.
[b] California's final standard is set as "zero detectable living organisms for all size classes." This final standard also does not have a volume or organism concentration associated with it.

In a nutshell, the California numeric standards represent the most environmentally protective goals if compared with federal and international regulations on ballast water. California's "zero detectable" standard has been a clear policy toward forcing technology change to deal with the marine invasive species transported by ballast water.

B. Other Developed Economies

1. The European Union

Roughly ten to fifteen percent of the 12,000 alien species in European countries are invasive and,[140] as the European Union's website on ballast water management provides, the role of that regional organization in the problem of marine invasive species in ballast water has been "limited" to (a) encourage its members to ratify and implement IMO's Convention on ballast water in their coasts and (b) offer technical guidance to its members.[141]

The main regional authority on marine environmental challenges is the European Marine Safety Agency, which is responsible for elaborating an "Action Programme" to assist European states in

140 KERSTIN SUNDSETH, EUROPEAN COMM'N, INVASIVE ALIEN SPECIES: A EUROPEAN RESPONSE (2014), https://ec.europa.eu/environment/nature/invasivealien/docs/ias-brochure-en-web.pdf [https://perma.cc/XJ5A-3DJT].

141 *Ballast Water*, EUR. MAR. SAFETY AGENCY, http://emsa.europa.eu/ssn-main/151-ballast-water.html [https://perma.cc/NU9F-LAUC] (last visited Mar. 18, 2022).

implementing the IMO Convention on Ballast Water.[142] Although the ratification and implementation of the international convention have been a primary responsibility of each member state, the European Maritime Safety Agency has helped these countries by providing them with technical support to organize a coherent plan and implement the Convention rules and goals within the Union territory.[143]

Though limited on policy and law, the European Union provides at least three main legal rules that impact directly or indirectly on the matter of marine invasive species. The most important law is EU Regulation 1143/2014, with the purpose of preventing, minimizing, and mitigating the adverse environmental impacts caused by invasive species in its territory.[144] To achieve this goal, the regulation provides the creation of a Union List of invasive species in its territory.[145] The criteria for including plants and animals in this list are the core instrument for the application of this regulation. Either way, member states can adopt stricter rules than those provided by the regulation.[146] Further, EU Regulation 1143/2014 expressly supports the ratification by all its Member States of the IMO Convention on Ballast Water.[147]

Another major European policy strategy on marine invasive species in the Marine Strategy Framework Directive, adopted in 2008, aimed to effectively protect the marine environment across Europe from threats caused by human activities such as overfishing, land-based waste, eutrophication, and pollution.[148] According to this Directive, each member state should develop a marine strategy for its marine

142 *Ballast Water Revised Action Plan*, EUR. MAR. SAFETY AGENCY, http://emsa.europa.eu/we-do/sustainability/environment/ballast-water/items.html?cid=151&id=670 [https://perma.cc/ZDS7-QLPR] (last visited Mar. 18, 2022).

143 *Id.*

144 Regulation (EU) No 1143/2014 of the European Parliament and of the Council of 22 October 2014 on the prevention and management of the introduction and spread of invasive alien species, 2014 O.J. (L 317), https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1417443504720&uri=CELEX:32014R1143 [https://perma.cc/K9VQ-GZRY].

145 *Id.* at art. 4.

146 *Id.* at para 38. ("It should be possible for Member States to maintain or adopt rules on invasive alien species of Union concern that are more stringent than those laid down in this Regulation and to apply provisions such as those set out in this Regulation for invasive alien species of Union concern to invasive alien species of Member State concern.").

147 *Id.* at para. 21.

148 Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive), 2008 O.J. (L 164), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0056 [https://perma.cc/C9GR-H43G] [hereinafter Marine Strategy Framework Directive].

waters in order to achieve or maintain good environmental status.[149] However, there is no mention of specific targets related to ballast water or marine invasive species in the Directive.[150]

There is still EU Directive 2000/59/EC on port reception facilities for ship-generated waste and cargo residues, which aims to "reduce the discharges of ship-generated waste and cargo residues into the sea, especially illegal discharges, from ships using ports in the Community, by improving the availability and use of port reception facilities for ship-generated waste and cargo residues, thereby enhancing the protection of the marine environment."[151] But whereas this directive results from policy efforts to enact Marpol 73/78, which does not cover environmental problems linked to ballast water,[152] there is no action provided therein to tackle the marine invasive species problem.

In sum, the European Union has a policy for ballast water management that is clearly aligned with the IMO approaches but, unlike federal or state initiatives in the United States, there is no regional policy directive or regulation on more stringent numeric limits for ballast water standards other than those set out in the IMO Convention on Ballast Water. Further, there is no public data on EU member states choosing not to create different regulatory standards other than those provided by the IMO Convention on Ballast Water.

2. Canada and Australia

Canada and Australia were some of the first countries in the world to experience the problem of marine invasive species and report it to the IMO.[153] Over the many years of negotiation around an international convention dealing with ballast water and marine invasive species, those countries not only pushed for global solutions but also worked intensively toward technical alternatives to tackle that challenge.[154] Both countries have ultimately incorporated the IMO Convention on

149 *Id.* art. 11.

150 Marine Strategy Framework Directive, *supra* note 148.

151 Directive 2000/59/EC of the European Parliament and of the Council of 27 November 2000 on port reception facilities for ship-generated waste and cargo residues, 2000 O.J. (L 332), http://extwprlegs1.fao.org/docs/pdf/eur35001.pdf [https://perma.cc/DB5G-C5RP].

152 *MARPOL 73/78*, *supra* note 72.

153 TAN, *supra* note 17, at 169.

154 *Id.* at 170.

Ballast Water into their regulatory policies on marine invasive species.[155]

Canada, for example, has established a set of rules known as Ballast Water Control and Management Regulations,[156] mostly following the international standards provided by the IMO Convention on Ballast Water. For transoceanic navigation, for instance, it imposes 200 nautical miles but a stricter water depth of 2000 meters as references for ballast water exchange.[157] Importantly, the use of reception facilities on ports for the purpose of sediment disposal from ballast water tanks is also a possible alternative allowed by those regulations.[158]

Australia does not, in general terms, differ from the Canadian rules on ballast water regulations.[159] The Australian approach requires certificates from vessels in order to check their compliance with rules on ballast water management plans based on the IMO Convention on Ballast Water.[160] According to the Australian Ballast Water Management Requirements, vessels should follow the international convention timeline to phase out the D-1 standard (based on ballast water exchange), replacing it in favor of the D-2 standard to require treatment discharge standards from all vessels. Further, according to the Australian regulation, ballast water discharges on reception facilities—although allowed—are not mandatory.[161]

For both Canada and Australia, it is possible to conclude that their national regulations do not provide any meaningful departure from basic international rules, including on port reception facilities, keeping them mostly out of touch with stricter regulations in the United States. Therefore, despite the major role of those countries in early international negotiations on the matter, their national regulations seem still largely insufficient to address the problem posed by ballast water.

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155 *Id.* at 169.

156 Ballast Water Control and Management Regulations, SOR/2021-120 (Can.), https://laws-lois.justice.gc.ca/eng/regulations/sor-2011-237/ [https://perma.cc/H8S8-CADS].

157 *Id.* at art. 6.

158 *Id.* at art. 10.

159 AUSTRAL. GOV'T, DEP'T OF AGRIC. & WATER RES, AUSTRALIAN BALLAST WATER MANAGEMENT REQUIREMENTS (2017), https://www.agriculture.gov.au/sites/default/files/sitecollectiondocuments/biosecurity/avm/vessels/ballast/australian-ballast-water-management-requirements.pdf.

160 *Id.*

161 *Id.*

C. Brazil

The Brazilian Department of Environment has identified forty-nine aquatic invasive species along its coastal area.[162] Golden mussels and sun coral have been the most publicly noted, as the former has caused a significant amount of economic damage,[163] and the latter affects marine sanctuaries and threatens to hit the highly biodiverse Amazon coastline.[164] It is very likely that both species were introduced in Brazil by ballast water in transoceanic ships.[165]

Three national regulations have been enacted by Brazilian authorities to deal with the ballast water problem: (a) the NORMAM 20/2005, enacted by the Brazilian Navy's Maritime Authority, dealing with the environmental impacts of the ballast water content;[166] (b) the ANVISA Resolution 72/2009, enacted by the Brazilian Food and Drug Administration (called ANVISA),[167] addressing human health concerns from ballast water;[168] and (c) the Oil Spill Statute 9966/2000, which is limited to vessels carrying oil but does not impose specific restrictions on the use of ballast water.[169]

Following the examples from the European Union, Australia, and Canada, Brazil has been an active party to the IMO Convention on Ballast Water[170] but at the same time does not provide any policy

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162 MINISTÉRIO DO MEIO AMBIENTE DO BRASIL, INFORME NACIONAL SOBRE ESPÉCIES EXÓTICAS INVASORAS (2009), http://arquivos.ambiente.sp.gov.br/consema/2011/11/oficio_consema_2009_244/Especies_Exoticas_Invasoras_propostas_de_estrategia.pdf [https://perma.cc/7QNP-D78].

163 GRUPO DE TRABALHO CORAL SOL: RELATÓRIO FINAL, *supra* note 1; *Mexilhão-dourado*, *supra* note 1.

164 GRUPO DE TRABALHO CORAL SOL: RELATÓRIO FINAL, *supra* note 1; *Mexilhão-dourado*, *supra* note 1.

165 GRUPO DE TRABALHO CORAL SOL: RELATÓRIO FINAL, *supra* note 1; *Mexilhão-dourado*, *supra* note 1.

166 THE OXFORD HANDBOOK OF THE LAW OF THE SEA, *supra* note 58.

167 Resolução ANVISA 72/2009, de 29 de dezembro de 2009, Diário Oficial da União [D.O.U.] de 21.8.2009 (Braz.), https://bvsms.saude.gov.br/bvs/saudelegis/anvisa/2009/res0072_29_12_2009.html [https://perma.cc/4F8H-RVJ3].

168 *Id.*

169 Lei 9.966/2000, de 28 de abril de 2000, Diário Oficial da União [D.O.U.] of 29.4.2000 (Braz.), http://www.planalto.gov.br/ccivil_03/leis/l9966.htm [https://perma.cc/2R8S-LMQA].

170 As Brazil has ratified the International Convention for the Control and Management of Ships' Ballast Water and Sediments, it has been an active party of the GloBallast Program created by the International Maritime Organization to provide technical support for some countries about ballast water management. *See GloBallast Program*, INT'L MAR. ORG.,

directions or regulations beyond the limited terms of those international directives. Further, unlike the U.S. EPA's role of issuing permits for vessels discharges on national waters, environmental agencies in Brazil have no major role in enforcing the IMO International Convention on Ballast Water.[171]

The Brazilian scenario, together with other major maritime states and institutions such as the European Union, Canada, and Australia, makes the United States the only country in the world that offers different (and stricter) rules and procedures for controlling and managing ballast water content from transoceanic ships when compared to the regulatory framework of the IMO Convention on Ballast Water. Either by involving the U.S. EPA and mandating individual permits for discharges into the American coastal and marine areas or by allowing states to adopt stricter performance standards for ballast water management by ships,[172] the United States regulatory strategies offer valuable examples of cutting-edge policies and regulations to tackle the marine invasive species problem.

D. A Forgotten Solution? The Port Reception Facilities Gap

Instead of the exchange or performance standards regulatory strategies largely adopted by countries to address the ballast water problem, the installation of reception facilities, which is an intuitive and straightforward solution to deal with marine pollution in general (including the problem of marine invasive species), has only a secondary role as a technical alternative to sediments and ballast water treatment.[173] This scenario occurs despite the IMO Conventions on marine pollution (MARPOL/73/78) and ballast water, which have both provided rules on reception facilities as an appropriate regulatory mechanism to mitigate the invasion of marine alien species.[174]

According to the U.S. EPA, many studies, regulations, and guidelines recognize the potential of reception facilities to treat ballast

https://www.imo.org/en/OurWork/PartnershipsProjects/Pages/GloBallast-Programme.aspx [https://perma.cc/4ZV7-X6PU] (last visited Feb. 3, 2022).

171 Resolução CONAMA 237/1997, de 19 de dezembro de 1997 (Braz.), the main regulation in Brazil about environmental impact assessment does not provide any directive on ballast water treatment.

172 Malone, *supra* note 106.

173 TAN, *supra* note 17, at 251.

174 GOLDSMITH & POSNER, *supra* note 27, at 76.

discharges,[175] but the U.S. EPA and the USCG reports on ballast water treatment have not addressed reception facilities.[176] The studies referred to by the U.S. EPA concluded that reception facilities are a technically feasible option for either the entire industry or part of the industry.[177] Other studies have found that cost or other factors could limit the use of reception facilities to part of the industry.[178]

Seeking to tackle sources of marine and coastal pollution from vessels, the Convention for the Prevention of Pollution from Ships (known as MARPOL 73/78) provides several rules directed to states parties to build reception facilities on ports and terminals.[179] Because the main concerns of that period were related to oil pollution, many of those rules referred to oil waste from ship tanks as a major vector of substance to be directed to reception facilities.[180]

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175 EPA, EFFICACY OF BALLAST WATER TREATMENT SYSTEMS: A REPORT BY THE EPA SCIENCE ADVISORY BOARD 80 (2011), https://nepis.epa.gov/Exe/ZyNET.exe/P100DCWA.TXT?ZyActionD=ZyDocument&Client=EPA&Index=2011+Thru+2015&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A%5Czyfiles%5CIndex%20Data%5C11thru15%5CTxt%5C00000003%5CP100DCWA.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=hpfr&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1&SeekPage=x&ZyPURL [https://perma.cc/Q8YW-H6L3].

176 *Id.*

177 LLOYD'S REGISTER, BALLAST WATER TREATMENT TECHNOLOGY: CURRENT STATUS (2010); Mark S. Minton et al., *Reducing Propagule Supply and Coastal Invasions via Ships: Effects of Emerging Strategies*, 3 FRONTIERS ECOLOGY& ENV'T 304 (2005); NAT'L RES. COUNCIL, STEMMING THE TIDE: CONTROLLING INTRODUCTIONS OF NONINDIGENOUS SPECIES BY SHIPS' BALLAST WATER (1996); Michael G. Parsons, *The Variable Buoyancy Ship: A Road to the Elimination of Ballast*, *in* EMERGING BALLAST WATER MANAGEMENT SYSTEMS: PROCEEDINGS FROM IMO AND WORLD MARITIME UNIVERSITY RESEARCH AND DEVELOPMENT FORUM (2010); R. LAUGHTON ET AL., POLLUTECH ENV'T, LTD, A REVIEW AND EVALUATION OF BALLAST WATER MANAGEMENT AND TREATMENT OPTIONS TO REDUCE THE POTENTIAL FOR THE INTRODUCTION OF NON-NATIVE SPECIES TO THE GREAT LAKES (1992); Euan D. Reavie et al., *Assessing Ballast Water Treatments: Evaluation of Viability Methods for Ambient Freshwater Microplankton Assemblages*, 36 J. GREAT LAKES RSCH. 540 (2010); G. RIGBY & A.H. TAYLOR, AUSTL. GOV'T DEP'T OF AGRIC., FISHERIES, & FORESTRY, BALLAST WATER RESEARCH SERIES REPORT NO. 13: BALLAST WATER TREATMENT TO MINIMIZE THE RISKS OF INTRODUCING NONINDIGENOUS MARINE ORGANISMS INTO AUSTRALIAN PORTS 93 (2001).

178 EPA, *supra* note 175, at 81.

179 *MARPOL 73/78*, *supra* note 72.

180 TAN, *supra* note 17, at 133.

Following the same strategy of MARPOL 73/78, the IMO Convention on Ballast Water provides rules on reception facilities as a safe alternative to the discharge of ballast water and sediments from transoceanic ships.[181] According to the IMO Convention on Ballast Water, countries should provide those reception facilities to allow the appropriate cleaning of vessels and tanks and avoid discharges on the ocean and coastal areas.[182]

But why would installing port reception facilities be a superior solution rather the current strategies, known as D-1 and D-2 standards, provided by the IMO Convention on Ballast Water?

The main problem of D-1 and D-2 standards has been their excessive reliance on official documents from flag states (certificates, books, and reports) while providing poor actual monitoring tools for coastal or port states in order to guarantee that ships effectively proceed as described in those papers.[183] It seems unlikely that such regulatory strategies would be capable of producing real results in eliminating or consistently reducing the risks of the introduction of marine invasive species in the near future.[184]

The critique of D-1 and D-2 standards may be best illustrated by looking at the example of the largest ships carrying cargo in bulk—tankers and dry bulk carriers. These ships almost invariably operate one-way services.[185] They carry primarily export commodities such as crude oil, iron ore, and coal, from a limited number of loading ports (located in export countries, such as Brazil and the United States), and subsequently, once they have delivered their cargoes, they return to the same ports with ballast water filling their otherwise empty tanks or

181 Int'l Mar. Org., *supra* note 23, art. 5.

182 Although the IMO Convention on Ballast Water does not use a different language to oblige or punish countries not complying to those rules on reception facilities, the level of enforcement remains not similar between countries around the world. North Sea countries, for example, have been complying with MARPOL 73/78 provisions. *See* Angela Carpenter & Sally M. Macgill, *The EU Directive on Port Reception Facilities for Ship-Generated Waste and Cargo Residues: Current Availability of Facilities in the North Sea*, 46 MARINE POLLUTION BULL. 21, 22 (2003). However, compliance rates vary among Mediterranean countries. Athanasios A. Pallis et al., *Environmental Policies and Practices in Cruise Ports: Waste Reception Facilities in the Med.*, 67 SPOUDAI J. ECON. & BUS. 54, 57 (2017). Vietnam, in turn, provides a more challenging framework. *See* Thanh Hoang Nguyen, *Study on the Implementation of the Port Reception Facilities Regulations of MARPOL in Vietnam*, 586 WORLD MAR. UNIV. DISSERTATIONS 1, 2 (2017).

183 For a critical view on flag states enforcing maritime international rules, see THE OXFORD HANDBOOK OF THE LAW OF THE SEA, *supra* note 58, at 304.

184 Patrick Donner, *Ballast Water Treatment Ashore—Better for the Environment and for Seafarers*, 9 WMU J. MAR. AFFS. 191 (2010).

185 TAN, *supra* note 17, at 171.

cargoes. These relatively few ports directed to export global commodities could provide reception facilities for ballast water so that a ship coming from export destinations could discharge all its ballast water ashore.[186] Accordingly, adopting reception facilities instead of treatments based on exchange or performance standards could also offer many technical advantages, such as reduced systems and fewer physical restrictions.[187]

But thinking on policy feasibility and legal accountability among relevant international actors, port reception facilities provide a solution for those states most interested in protecting their coastal ecosystems. Instead of relying on ships following obscure requirements from their flag states, the installation of port reception facilities shifts the search for a solution to those countries most affected by ballast water transportation, making them accountable to be a central part of the problem-solving policy solution rather than just following foreign rules of flag states. After all, flag states do not support most of the environmental and economic damage triggered by marine invasive species.[188]

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186 Donner, *supra* note 184, at 97. The author contends that ballast water could be treated in reception facilities ashore and then put to a beneficial use:

> It is true that the volume of ballast water on such ships is measured in the tens of thousands of tons so that the envisaged reception facility would need to have capacity to receive and treat large amounts of water. On the other hand, the volume of ballast is no greater than that already carried on board by the ships, so building storage capacity commensurate with the cargo handling capacity of the port is not an unreasonable undertaking. Another argument for port-based reception and treatment facilities is that the received ballast water could be desalinated, which is a relatively effective treatment method in itself, and after some further treatment like chlorination it could provide fresh water for household use or irrigation – a scarce and valuable commodity in many places.

Id.

187 EFFICACY OF BALLAST WATER TREATMENT SYSTEMS, *supra* note 175, at 81. The EPA Science Advisory Board has recognized the technical advantages of adopting ballast water reception facilities:

> The potential advantages of reception facilities over shipboard treatment systems include: fewer reception facilities than shipboard systems would be needed; smaller total treatment capacity would be needed; and reception facilities would be subject to fewer physical restrictions, and would therefore be able to use more effective technologies and processes such as those commonly used in water treatment. A shift from shipboard treatment to reception facilities is in some ways analogous to a shift from household septic tanks to centralized wastewater treatment plants.

Id.

188 TAN, *supra* note 17, at 47.

To avoid risks of increased transaction costs and reduced global competitiveness by those states responsible for mandating the installation of port reception facilities, the optimizing solution should be global, which would affect the shipping and ports industries no matter their location or jurisdiction. But considering the natural limitations of international law for dealing with national states interests,[189] countries should assume their responsibility for protecting their coastal ecosystems (as directed by Article 194(1) of UNCLOS)[190] and work on national policies and regulations to create a process of providing their ports with reception facilities.

Even from an economic perspective, installing port reception facilities seems to offer a better cost-effective balance.[191] In comparison, the installation of reception facilities in a few thousand ports around the world could cost much less than the investment to provide technology for tens of thousands of ships.[192]

If discharging sediments and ballast water into reception facilities on land, thereby avoiding their release in oceans and coastal areas, demonstrates a more effective method to eliminate or dramatically reduce the possibility of marine invasive species, could environmental agencies and regulations play a more decisive role on that infrastructure solution? To answer these questions, this Article discusses the potential role of the environmental impact assessment in Brazil as a regulatory tool able to enforce the IMO Convention on Ballast Water provisions on installing port reception facilities in that country.

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189 TAN, *supra* note 17.

190 United Nations Convention on the Law of the Sea art. 194(1), Dec. 10, 1982, 1833 U.N.T.S. 397. Article 194(a) states:

> States shall take, individually or jointly as appropriate, all measures consistent with this Convention that are necessary to prevent, reduce and control pollution of the marine environment from any source, using for this purpose the best practicable means at their disposal and in accordance with their capabilities, and they shall endeavour to harmonize their policies in this connection.

191 Donner, *supra* note 184, at 102 ("Firstly, it is contended that a ballast water reception and treatment facility ashore would offer economies of scale. Assuming that there would be ships arriving at the port in ballast on a regular basis, the ballast water reception and treatment facility could operate more or less continuously, which would appear to be more effective and rational than only operating the equipment from time to time when a vessel is taking, carrying or discharging ballast water.").

192 *Id.* at 104 ("Surely, the total investment in reception and treatment facilities in a few thousand ports around the world would have been less than fitting and retrofitting the necessary equipment on nearly 50,000 ships and it appears reasonable to assume that the same applies to the operating costs.").

V
IMPLEMENTING PORT RECEPTION FACILITIES: THE POTENTIAL ROLE OF THE ENVIRONMENTAL IMPACT ASSESSMENT IN BRAZIL

Because implementing international environmental laws usually affects business as usual, internalizing and implementing their principles and rules has been a challenging goal for most countries in the world.[193] Especially when international rules seek to impose national measures that increase transaction costs and might reduce local competition in global markets, such as installing reception facilities on ports,[194] there would be no economic or political incentive to enforce those rules on a national or local level.[195]

On the national level, environmental law and policy offer an innovative regulatory tool called an "environmental impact assessment," which was created by the National Environmental Policy Act (NEPA) in the United States[196] with the purpose of imposing to government agencies measuring the impacts of a policy or action on the environment. The success of the American experience led to the spreading of the environmental impact assessment throughout the world, and many countries have adopted that same strategy, Brazil included.[197]

Then, suppose the environmental impact assessment provides appropriate information to agencies before deciding to allow permits for infrastructure or policy initiatives on the national level. In that case, there is no apparent reason for preventing its usefulness for enforcing international environmental law, which should include IMO rules concerned with protecting coastal or ocean environments. Once an international rule is internalized by a country (usually after a decision made by Congress and the executive branch), that norm becomes law and therefore should be applied.

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193 Jutta Brunnée, *Enforcement Mechanisms in International Law and International Environmental Law*, *in* ENSURING COMPLIANCE WITH MULTILATERAL ENVIRONMENTAL AGREEMENTS 1 (Ulrich Beyerlin et al. eds., 2nd ed. 2006).

194 TAN, *supra* note 17, at 107. Several countries and shipping industry actors express concerns on procedures delaying on ports (increasing transaction costs) if they are mandated to discharge sediments and ballast water in reception facilities.

195 TAN, *supra* note 17.

196 National Environmental Policy Act of 1969, 42 U.S.C. § 4332.

197 Nicholas A. Robinson, *International Trends in Environmental Impact Assessment*, 19 B.C. ENV'T AFFS. L. REV. 591 (1991).

As it occurs with many infrastructure projects, the regular building and operation of ports usually assumes a set of direct environmental impacts, usually on coastal areas, but it is also linked to the shipping industry, which depends on ports as destinations for departures or arrivals. Accordingly, if a government decision to build and operate a port should be previously assessed on its impacts on the environment, implying the participation of environmental agencies (depending on the regulatory architecture adopted), the most threatening activities for biodiversity involved in the future operation of a port should be an essential part of the environmental impact assessment.

According to the Brazilian environmental regulation on environmental impact assessment, it is the duty of the environmental agency responsible for issuing a permit for an infrastructure project to enforce national laws and regulations on environmental protection in order to validate the environmental impact assessment.[198] Still, although Brazil has been an active part of the IMO conventions on marine pollution, international rules on port reception facilities—provided by MARPOL 73/78 and the IMO Convention Ballast Water—remain unenforced by environmental agencies in the context of the environmental impact assessment, as discussed next in this Article.

It should be the role of policymakers and judicial authorities to guide administrative authorities toward compliance with national and international rules (once internalized). To achieve that goal, regulatory and legal strategies should be created and effectively implemented according to the regulatory tools available. For environmental law and policy, one of the most promising pathways for that purpose could be the appropriate use of the environmental impact assessment. Brazil, in particular, has a strong regulatory framework and practice on permits issued and controlled by environmental agencies based on mandatory environmental impact assessments to infrastructure projects, and those permits could be highly effective to enforce the Law of the Sea dealing with reception facilities on ports and terminals.

A. EIA and Ports: Background in Brazil

According to the Brazilian Constitution, economic activities with significant impact on the environment should be subject to environmental impact assessments.[199] And to regulate what economic

198 Resolução CONAMA No. 237/1997, de 19 de dezembro de 1997, art. 1(1).

199 CONSTITUIÇÃO FEDERAL [C.F.] [CONSTITUTION] art. 225 (BRAZ.).

activities have a significant impact on the environment, there is an environmental regulation called Resolução CONAMA nº 237/1997,[200] which requires an environmental assessment for major infrastructure projects and industries.[201] Among the infrastructure projects under environmental assessment, the Brazilian regulation recognizes the building of ports and oil terminals under a mandatory environmental permit issued by an environmental agency, based on an environmental impact assessment.[202]

Unlike the United States, where permits should be issued by federal agencies and environmental impact assessments are prepared by official authorities within those agencies,[203] Brazil has adopted a model that directs environmental permits for infrastructure projects exclusively to its environmental agencies (on the federal or state levels depending on its location) and directly charges the industry (the project owner) for financing and elaborating the environmental impact assessment.[204]

Then, the Brazilian environmental regulation provides several strict requirements for the elaboration of an environmental impact assessment, including early mandatory guidelines from the environmental agency for each individual project.[205] Further, as environmental licenses have limited deadlines that vary according to the type of project, for every extension of that license, the interested company must provide evidence that it is complying with all environmental requirements imposed in the environmental license.[206]

That regulatory framework raises a question: If Brazil's regulations require an environmental impact assessment for building ports, and the Law of the Sea (MARPOL 73/78 and the IMO Convention on Ballast Water) guides states to provide reception facilities on ports and oil terminals, how has that regulatory tool been used to enforce those specific international rules in Brazil?

Although the Brazilian regulation offers a strong tool for protecting coastal ecosystems through its environmental licenses, there is no

200 Resolução CONAMA No. 237/1997, de 19 de dezembro de 1997.

201 *Id.* at art. 3.

202 *Id.* at annex 1.

203 The National Environmental Policy Act § 102(C), 42 U.S.C. § 4332(C).

204 Resolução CONAMA No. 237/1997, art. 11.

205 *Id.* at art. 10(I).

206 *Id.* at art. 19.

official data available on how many ports in Brazil provide reception facilities.[207] Two recent projects under environmental impact assessment, discussed next in this Article, point out a likely scenario of widespread failure to enforce international rules on port reception facilities.

B. Assessing Two EIAs for Large Ports in Brazil

To respond to the question posed earlier in this Article, two major and recent projects for building ports in Brazil will be briefly considered: (a) a large port project called "Porto Sul," located in the state of Bahia, and (b) the project of the one of the largest operating ports in the country, called "Porto de Paranaguá."

1. Porto Sul

According to the environmental license issued by IBAMA (the main environmental agency in Brazil),[208] "Porto Sul" is a project for a port located in the south of the state of Bahia to provide infrastructure for exportation of mining and agribusiness commodities.[209] It is expected to be the largest port in the Brazilian Northeast, trading more than seventy-five million tons of commodities per year, including iron ore, soybeans, and fertilizers.[210]

Searching for ballast water directives in the environmental license process for Porto Sul, there are just a few recommendations written by the environmental agency directed to the owner of the project, all dealing with educational instructions to be provided by the port authorities to ships' crews, monitoring plans to oversight and control marine invasive species, and, in general terms, to comply with international rules on ballast water. However, there is no mention about

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207 The website of the main agency on ports in Brazil, called ANTAQ, does not provide public data on port reception facilities. *Agência Nacional de Transportes Aquaviários (ANTAQ)*, GOV.BR, https://www.gov.br/antaq/pt-br (last visited Mar. 18, 2022).

208 INSTITUTO BRASILEIRO DO MEIO AMBIENTE E DOS RECURSOS NATURAIS RENOVÁVEIS, PARECER Nº 09/2012–COPAH/CGTMO/DILIC/IBAMA (2012), [hereinafter PORTO SUL LICENSE].

209 Brazil is a major player for global trade on agribusiness and mining commodities such as soya, meat, corn, and iron ore. *See* ORG. ECON. COOP. & DEV., REVIEW OF AGRICULTURAL POLICIES IN BRAZIL (2005), https://www.gov.br/agricultura/pt-br/assuntos/politica-agricola/todas-publicacoes-de-politica-agricola/revista-de-politica-agricola/2000-a-2016/revista-de-politica-agricola-edicao-especial-2005-versao-ingles.pdf [https://perma.cc/DWL2-9TNN].

210 PORTO SUL LICENSE, *supra* note 208.

installing a reception facility to sediments or ballast water discharges on Porto Sul.[211]

2. Porto de Paranaguá

The fifth-largest port in Brazil,[212] called "Porto de Paranaguá," is in Southern Brazil and is responsible for facilitating major export commodities such as iron ore, soybeans, and corn.[213] Since 2003, it has been submitted to an environmental impact assessment within a major national policy to review meaningful infrastructure plants in Brazil and reduce their environmental impacts.[214]

According to the Brazilian Environmental Agency responsible for the licensing process of Porto de Paranaguá, in an official report that guides the environmental license,[215] the only references to ballast water management deal with educational programs to ships and general provisions on compliance of international rules. There is no mention of installing reception facilities on ports for the purpose of discharges of sediments or ballast water.[216]

In both cases, Porto Sul and Porto de Paranaguá, the environmental impact assessment and the environmental license, as regulatory tools available for protecting coastal and marine areas along the Brazilian shore, have generally ignored the Law of the Sea on provisions about installing reception facilities on ports for the purpose of discharges of sediments and ballast water, according to MARPOL 73/78[217] and the IMO Convention on Ballast Water.[218]

Porto Sul and Porto Paranaguá well illustrate a gap in Brazil that could be fulfilled by environmental agencies through environmental impact assessments under their responsibilities, in order to enforce both the MARPOL 73/78 and the IMO Convention on Ballast Water. After

211 *Id.*

212 AGÊNCIA NACIONAL DE TRANSPORTES AQUAVIÁRIOS (ANTAQ), http://web.antaq.gov.br/Anuario/ [https://perma.cc/38P6-GYV5] (last visited Mar. 18, 2022).

213 *Id.*

214 The Brazilian Constitution provision on environmental impact assessments has been applied for old infrastructure industries, such as ports, highways, and hydroelectric plants, by IBAMA, which is called "licenciamento corretivo." *See* https://www.ibama.gov.br/laf/sobre-o-licenciamento-ambiental-federal [https://perma.cc/HD4Y-ETPD].

215 INSTITUTO BRASILEIRO DO MEIO AMBIENTE E DOS RECURSOS NATURAIS RENOVÁVEIS, PARECER Nº 212/2010 - COTRA/CGTMO/DILIC/IBAMA (2010).

216 *Id.*

217 *MARPOL 73/78*, *supra* note 72.

218 Int'l Mar. Org., *supra* note 23.

all, the UNCLOS, the MARPOL 73/78, and the IMO Convention on Ballast Water have overall general provisions to countries to adopt national policies and strategies that protect their marine and coastal ecosystems. The MARPOL 73/78 and the IMO Convention on Ballast Water are even more specific: countries should provide reception facilities in their ports for the purpose of sediments and ballast water treatment.[219]

CONCLUSION

Innovative regulatory approaches based on new science and engineering will be necessary to appropriately address the ballast water problem. Relying only on exchange or performance standards (D-1 and D-2 standards) seems to not only be a technically limited approach to eliminate or drastically reduce the marine invasive problem but also reveals a poor enforcement mechanism because of its exaggerated dependency on bureaucratic information provided by ships operators. There should be no doubt that the transition from ballast water exchange toward numeric limits has been important progress, but such a solution deals with enormous limitations to eliminate the problem. Except for California's "zero detectable" standards, numeric limits entail continued transportation of living organisms, though in a reduced quantity. Further, the institutional mechanisms for monitoring and effectively controlling all those standards are based on bureaucratic strategies (overview of certificates, reports, books) and do not offer any actual guarantee of compliance by ships operators.

To overcome the insufficiency of exchange or performance approaches (D-1 and D-2) as an adequate regulatory strategy, countries around the world should enforce international rules largely ignored on the installation of reception facilities on ports. According to the IMO Convention on Ballast Water, all ports should be equipped with reception and treatment facilities for the safe disposal of ballast water and sediments (Chapter 7.2 of the Guidelines and Articles 4.2 and 5.1 of the Convention). There could not be a more straightforward rule.

But to avoid the fate of MARPOL 73/78 and its similar provisions on port reception facilities installations, a different regulatory strategy should be implemented in those countries combining strong environmental regulations and a major economic role in global markets of commodities, such as Brazil. In this sense, the use of environmental impact assessments required for licensing ports has a potential role to

219 *Id.* at 15.

ensure compliance with the IMO Convention on Ballast Water rules on reception facilities. After all, the main purpose of the IMO Convention on Ballast Water and its provisions on reception facilities is primarily to protect marine and coastal ecosystems.[220]

A strategy for protecting coastal areas from marine invasive species transported by ballast water would, at the same time, reinforce compliance with Article 194(1) of UNCLOS, which provides that all states take

> individually or jointly as appropriate, all measures consistent with this Convention that are necessary to prevent, reduce and control pollution of the marine environment from any source, using for this purpose the best practicable means at their disposal and in accordance with their capabilities, and they shall endeavor to harmonize their policies in this connection.[221]

Thus, having a strong environmental regulatory framework for environmental impact assessment involving infrastructure projects, Brazil could play a decisive role in enforcing UNCLOS and the IMO Convention on Ballast Water and lead other countries in the same direction.

We should not lose sight of the main goal of ballast water international regulations: eliminating the transfer of invasive species among different global regions. This is necessary to avoid threats to marine and coastal biodiversity and economic activities that depend on those ecosystems, such as fishing. A comprehensive regulatory treatment for the problem should therefore expand the current focus solely on ballast water exchange or performance standards to cover port reception facilities as well. For this purpose, there is no regulatory tool better positioned in Brazil to deal with the problem than the environmental impact assessment.

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220 TAN, *supra* note 17, at 171.

221 United Nations Convention on the Law of the Sea, *supra* note 60, at art. 194(1).