'Challenges and Regulatory Precautionary Approach of Flag States in Implementing Obligations Under the Ballast Water Management Convention'

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ABSTRACT

Increasing shipping activities necessitated by an upsurge in international trading has a resultant impact on the marine ecosystem. Apart from the usual incidences of marine pollution and oil spillages, the introduction and transfer of invasive alien species (IAS), often known as harmful aquatic organisms and pathogens (HAOP), are increasing and impacting marine ecosystems and biological diversities. In realization of these threats, at the United Nations Conference on Environment and Development (UNCED), the International Maritime Organization (IMO) was requested to consider the adoption of appropriate rules on ballast water discharge based on the understanding that ships' ballast water serves as a pathway for such bio-invasion transfer.

Responding to these challenges led to the adopting of several regulations, technical guidelines, and rules, including the Ballast Water Management Convention in 2004. Hence, implementing the Convention has several implications for the existing legal regimes on flag states. The Convention and its Guidelines are complex and technical, coupled with a differential approach to ballast water management (BWM) by non-state parties like the U.S. Therefore, this research paper analyses some of the challenges and precautionary regulatory approaches for flag states in implementing the Convention while carrying out their obligations under the Convention. It concluded by suggesting a reflection of universally acceptable and environmentally friendly standards for ballast water management and treatment for containing the increasing prevalence of bio-invasion in the marine ecosystem.

Keywords: invasive alien species (IAS), USCG, liability, ballast water management (BWM), ballasting and de-ballasting, flag state

INTRODUCTION

Background/Overview of the Study

It is a fact that there has been an upsurge of human needs necessitated by population increase and advancement in technology in this century. Maritime activities, including shipping, are at the hub of economic activities occasioned by human needs.[1] The marine environment is not left out; several parameters are equally affected. Statistically, about 90% of world trade is conveyed by the international shipping industry, without which the import and export of affordable food and goods would not be possible, and half of the world would starve while the other half would freeze.[2] International shipping is the lifeblood of world trade, with more than one hundred and fifty "flag states" and about 1.25 million seafarers. [3]

Thus, the International Maritime Organization (formerly Inter-Governmental Maritime Consultative Organization, IMCO until 1982) was instituted as a specialized agency of the United Nations in 1948; IMO is primarily a global standard-setting body for the security, safety, and environmental performance of international shipping. Its primary role is to create a regulatory framework for the shipping industry that is fair, effective, universally adopted, and universally implemented.[4]

Indeed, ships are designed and built to move safely through the high sea while carrying cargo. Years ago, ships carried solid ballast in the form of rocks, sand or metal. From around the 1880s, seafarers started using water as ballast, mainly because water is readily available, more accessible to load on board [ballasting] and off a ship [de-ballasting], and therefore, more efficient and economical than solid ballast.[5] Ballast water compensates for the weight of a ship, which may affect ship safety and stability.[6] Discharge of ballast water is recognized as a crucial threat to the marine environment since it is the mode of transportation of invasive alien species (IAS).[7] It is estimated that around 10 billion tonnes of ballast water, which is moved by shipping each year globally, contains many species of living organisms present in the ballast water at a given time. They are moved with ballast water from region to region and country to country; it is anticipated that approximately 7,000 species worldwide will be moved daily. Cysts of these marine organisms associated with ballast water sediments can remain dormant until they find a suitable growing environment.

Moreover, many other marine species, such as sea-weeds and barnacles, survive while adhering to the ship's hull. Therefore, shipping is responsible for introducing aquatic species as a critical vector for the movement of species.[8] The introduction of invasive alien species by ballast water is severely threatening marine ecosystems around the world. Invasive alien species (IAS) introduce environmental and economic harm and may threaten human health.[9]

Hence, IAS presents a significant threat to marine ecosystems, and shipping has been identified as a major pathway for introducing species to new environments.[10] The problem increased as trade and traffic volume expanded over the last few decades. The effects of introducing new species have been catastrophic in many areas of the world.[11] Available data shows that the rate of bio-invasions is increasing at an alarming rate, and as the volumes of seaborne trade continue to grow, the problem may not yet have reached its peak.[12] Although scientists first recognized the signs of an alien species introduction after a mass occurrence of the Asian phytoplankton algae Odontella (*Biddulphia sinensis)* in the North Sea in 1903, it was not till the 1970s that the scientific community began evaluating the problem in detail.[13] Later, in the late 1980s, Canada and Australia were among countries experiencing particular problems with invasive species, and they brought their concerns to the attention of IMO's Marine Environment Protection Committee (MEPC).[14]

Through the 1990s, countries that had experienced significant invasive species-related problems linked to ballast water discharge began to take steps to lessen their risks through initiatives such as reporting mechanisms and discharge restrictions. However, they encountered a significant problem. The issue was not on the global environmental agenda, notwithstanding the general responsibility under the United Nations Convention on the Law of the Sea (UNCLOS)[15], which urges states to prevent, among other things, "the intentional or accidental introduction of species, alien or new, to a particular part of the aquatic environment, which may cause significant and harmful changes thereto."[16] At first, most stakeholders, including governments, port authorities, shipping companies, fisheries and the public, were unaware of the potentially severe consequences of transferring unwanted marine organisms through ballast water. As the possible scale and nature of the problem became apparent, proper control and management of ships' ballast water surfaced as a priority issue on the environmental agenda of the IMO and the global industry.[17]

Thus, in 1992, at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, Brazil, the IMO was requested to consider adopting appropriate, legally binding rules to prevent the spread of non-indigenous organisms. Specific conditions in this respect were included in paragraph 17.30(a)

(vi) of Chapter 17 of Agenda 21, which deals with the principal areas of responsibility for the IMO. The Convention on Biological Diversity (CBD) adopted during the same period also mandates the state parties to prevent introducing, controlling, or extorting alien species that threaten ecosystems, habitats, or species. [18]

The IMO Assembly adopted the "Guidelines for the Control and Management of Ships' Ballast Water, to Reduce the Transfer of Harmful Aquatic Organisms and Pathogens" by Resolution A.868 (20) in 1997.[19] These were essential building blocks for the Ballast Water Management Convention and its associated Technical Guidelines.[20]

Hence, the International Convention for the Control and Management of Ships Ballast Water and Sediments (BWM Convention or the Convention) was adopted in 2004 and entered into force on September 8, 2017, with the crucial aim of preventing the spread of harmful aquatic organisms from one region to another by establishing standards and procedures for management and control of ship's ballast water and sediments.[21] To complement the BWM Convention, the IMO has adopted over 15 guidelines (including Guidelines for Ballast Water Exchange in the Antarctic Treaty area)[22] and other documents in Marine Environment Protection Committee (MEPC) resolutions and circulars.[23]

Statement of Problem

IASs significantly threaten native biodiversity, natural ecosystems, and ecosystem services. They mainly devastate island ecosystems, harbouring much of the world's threatened biodiversity. Amongst these isolated populations, extinction rates are incredibly high. As international trade and travel volumes increase, the invasive species problem is growing in severity and geographic extent. Practical initiatives, which contribute to better management practices and a reduced incidence of biological invasion, are being taken by communities worldwide.[24] The IAS arrive silently into harbours, estuaries and coastal waters from ballast tanks of ships travelling from distant ports, and they may perish, or with stunning speed, they may alter an entire ecosystem.[25] They are widespread worldwide and are found in all categories of living organisms and all types of ecosystems.[26]

The introduction of IAS in the marine environment has received heightened recognition because of its threats to ecosystem health, endangered species, economic interests, and public health.[27] There are well-known invasive alien species which severely disrupt native ecosystems and cause enormous economic impacts. For example, the North American Jellyfish (*Mnemiopsis ieidyi*) was introduced from the Eastern seaboard of North and South America to the Black Sea, severely destroying the Black Sea fishing industry. [28] Conversely, Zebra Mussel (*Dreissena polymorpha*) was transferred from the Black Sea to North America, and it caused blockage of cooling pipes of power plants and changed the aquatic food web.[29] Zebra mussels, which are very small in size, severely restrict the water flow to municipal facilities and power plants by attaching to cooling systems, and they fasten to native mussels and clams to feed, grow, move and reproduce themselves, which causes native mussels and clams not able to open their shell to eat.

The current primary concern over IAS is that its impacts are already substantial and are quickly growing in scope because the international movement of cargo and people is increasing due to globalization.[30] IAS is one of the major threats to worldwide biodiversity because it is almost impossible to eradicate the problem caused by IAS once it is established in the marine environment. More so now, the loss of biological diversities has been recognized as one of the triple planetary crises.[31]The U.N. General Assembly in this regard adopted a resolution noting that the resulting loss of biodiversity and the decline in services provided by ecosystems interfere with the enjoyment of a clean, healthy, and sustainable environment and that environmental damage has negative implications, both direct and indirect, for the effective enjoyment of all human rights.[32]

Therefore, the international community must take prompt and appropriate measures, especially by flag states, before IAS is established and affects the native marine environment around the world beyond control.

Objective and Purpose of the Study

Given the object and purpose of this research, which is mainly to get a clearer understanding of how flag states can efficiently implement the BWM Convention towards achieving a minimal transfer of IAS and improving the protection of the marine environment, it is expected to show thus:

1. An insightful understanding of states' obligations under the BWM Convention, especially as it relates to flag states,
2. Analysis of the major ballast water management methods and standards,
3. Show how some of the possible challenges will be resolved, and
4. Review the precautionary regulatory approach required of flag states in implementing the BWM Convention and the implication of a differential approach under the USCG regulations and U.S. states' rules.

Limitations of the Study

An apparent perusal of the BWM Convention indicates that the parties are urged to give full effect to the Convention to mitigate the transfer of harmful aquatic organisms and pathogens (HAOP) through the ship's ballast water control and management and the use of standards. This obligation is inclusively for both port states and flag states.

However, the primary focus of this paper is primarily on the challenges flag states encounter in implementing the BWM Convention and the differential regulatory precautionary approach required of them. Hence, this work does not intend to articulate the general scope of flag states' liability under the law of the sea regime; instead, recourse will be made to it briefly. It is paramount to understand the nature of the challenges of flag states within the contemplation of the BWM Convention, given its Article 2(3), which allows parties to apply stringent measures for the prevention, reduction, or possibly elimination of the transfer of harmful aquatic organisms and pathogens through the control and management of ship's ballast water. Thus, this is the overall scope of this research.

METHODOLOGY

The background to adopting the BWM Convention is examined, and two practical ballast water management standards are examined by reviewing the documentary reports. International legal materials were discussed with the traditional doctrinal approaches. The challenges in implementation by flag States and shipowners of parties to the BWM Convention are identified and scrutinized by studying and analyzing the relevant resources like the Convention, Guidelines, Circulars, and ongoing discussions at the IMO. Cross-references to other Conventions, such as the UNCLOS, the SOLAS and the MARPOL Convention, were also made.

Definition of Keywords

- **Ballast Water (B.W.):**

Ballast means any solid or liquid brought on board a vessel to increase the draft, change the trim, and regulate the stability or maintain stress loads within acceptable limits. Therefore, ballast water is "water with its suspended matter taken on board a ship to control trim, list, draught, stability, or stresses of the ship."[33]

Such water has a good weight-to-volume ratio and is carried in separate tanks used just for ballast or balance or in empty cargo tanks. When a vessel leaves a port, water and any sediment that may be mixed up is pumped into the vessel's ballast tanks and rereleased when it takes on shipload at the next port.[34]

- **Invasive Alien Species:**

Invasive alien species (IAS), also known as harmful aquatic organisms and pathogens (HAOP) under the Convention, are species which are transferred outside of their natural areas and transported to new areas where they do not typically appear under certain circumstances; species become established, and, in the lack of natural controls, for example, parasites or predators, multiply and become invasive, thereby threaten the original ecosystem and its species. HAOP means "aquatic organisms or pathogens which, if introduced into the sea including estuaries, or into freshwater courses, may create hazards to the environment, human health, property or resources, hurt biological diversity or hinder other legitimate uses of such areas"[35] Also, it includes aquatic plants (phytoplankton), aquatic animal species (zooplankton) and aquatic pathogens that are not native and that may flourish in a new marine environment when introduced by various paths such as shipping. It also means an alien species that becomes established in natural or semi-natural ecosystems or habitats as an agent of change and threatens indigenous biological diversity.[36] Bai defined it as an "alien species that becomes established in a marine ecosystem or environment and then influences and threatens the native biological diversity."[37] Thus, the Convention on Biological Diversity sees IAS as species introduced deliberately or unintentionally outside their native habitats where they can establish themselves, invade, out-compete natives and take over new environments.[38]

- **Flag State:**

The traditional concepts of statehood do not always apply to international shipping and maritime law.[39] Flag State connotes; "the state which has granted to a ship the right to sail under its flag."[40] Akehurst defined it as "the state whose nationality the ship possesses."[41] Also, under *Article 91(1)* of the United Nations Convention on Law of the Sea (UNCLOS), the concept of flag state presupposes that ships have the nationality of the country whose flag they are empowered to fly. It implies, amongst other things, that the state is allowed under international law to exercise its jurisdictional control over a vessel and is mandated to implement national and international obligations, including environmental protection standards.[42] Hence, the flag state's authorities accord such nationality to vessels via registration. However, there are certain exceptions to flag states' jurisdiction over ships, for instance, piracy, the slave trade, stateless ships, and so on.[43]

REVIEW OF BWM SYSTEMS AND STANDARDS

BWM Systems and Control Measures for Ships

The crux of ballast water management (BWM) is part of the broader issue of bio-security control. Biosecurity is the assessment and management of potentially dangerous infectious diseases, quarantined pests, invasive (alien) species, living modified organisms and biological weapons.[44] It is a strategic and integrated approach to analyzing and managing relevant risks to humans, bio-diversities, and associated threats to the marine environment.[45] In this regard, the IMO adopted the BWM Convention in 2004. The Convention obligates all ships to implement a ballast water management plan.[46] All ships must also carry a ballast water record book[47] and are expected to carry out ballast water management procedures to a given standard. Parties to the Convention are allowed to take extra measures subject to guidelines set out in the Convention and the IMO Guidelines.

In the context of regulation, ballast water management implies all mechanical, physical, chemical, and biological processes applied severally or jointly to remove, render harmless or avoid the uptake or discharge

of harmful aquatic organisms and pathogens within ballast water sediments. These refer to those marine organisms that create hazards to the environment, human health, and resources and impair biological diversities.[48] The Convention applies to all ships, including submersibles, floating craft, and floating platforms, with the exceptions stipulated under *Article 3* of the BWM Convention. As specified in its guidelines, the essences of the Convention include the requirements for carrying out ballast water exchange and ballast water performance.[49]

Similarly, the BWM Convention requires that ballast water management systems used to comply with the Convention must be accepted by the Administration considering the *Guidelines for Approval of Ballast Water Management Systems* (G8), which specify the technical requirements and certification procedures of any BWM system.[50] IMO shall approve any systems that use Active Substances to comply with the Convention under the *Procedure for Approval of Ballast Water Management Systems that use Active Substances* (G9).[51] The G8-Guidelines and the G9-Guidelines both require that the testing body performing the test should have performed appropriate quality control measures following recognized international standards acceptable to the Administration and that all the tests should be carried out in line with internationally recognized guidelines.[52]

Several BWM treatment measures require that the Administration accept such systems in line with IMO Guidelines.[53] These involve systems which make use of chemicals or biocides, make use of organisms or biological mechanisms, or modify the chemical or physical characteristics of the Ballast Water, and they will be briefly highlighted as follows for better understanding, notwithstanding being technical as it will help to appreciate the differential requirements of the USCG:

Electro-Chlorination (E.C.)

E.C. is one of the few technologies the IMO and the USCG approved, and it involves the use of electrolytic disinfection; that is, electro-chlorination relies on the generation of chlorine gas, which, when it reacts with water, produces hypo-chlorous acid with powerful oxidant action.[54] It is often combined with the filtration system. Chlorine is probably the most common biocide in use today due to its cost-effectiveness. Chlorine can be added to water in various forms, including chlorine gas, sodium hypochlorite liquid, calcium hypochlorite powder, or tablets.[55] B.W. with excess free chlorine is unsuitable for discharge in an untreated condition, and to overcome this problem, de-chlorination is required before release.[56] Thus, this system seems not less problematic concerning its practicality, efficiency and possible environmental impacts upon discharge in marine environments, coupled with the possibility of accelerated rates of carbon-steel corrosion because of the corrosive action of the active agents produced during ballast water treatment.[57] However, properly using biocides like chlorine to remove IAS should satisfy the need for effectiveness in inactivating and removing any residual effect of biocides discharge in ballast water.[58]

Ultra-violet (U.V.) Irradiation/ Disinfection

The use of this system is equally combined with filtration. It involves filtering the particulates and more significant organisms, followed by U.V. disinfection. Due to absorption effects, U.V. systems can destroy bacteria, and they are effective for micro-organisms, though not for waters with suspended organisms.[59] Again, unlike active substances, it has no toxic, corrosive effect on the vessel. U.V. systems are easy to install and retrofit and have few safety concerns from a class point of view. They also operate independently, regardless of water salinity and temperature, but they depend on water transmittance (UV-T) and work less well in turbid water.[60]

However, there had been some concerns that the USCG would not approve the U.V. treatment system until the recent USCG type-approval of the Optimarin system, which equally uses the U.V. technology; although it seems the U.V. systems will be allowed by the USCG but with a requirement that the treatment must kill

the organisms. It might not be a serious concern since this does not require much power than what is desired to render the organisms unable to produce accordingly. So, the pathway for this system starts from ballasting through mechanical and physical filtration. It then passes through disinfection, which may also combine chemical and U.V. treatment before entering the ballast tank, which will later be discharged as treated ballast water during de-ballasting.

Filtration

The ballast water filtration system is hugely paramount in modern ships. While operating at the port of origin, filtration can reduce the densities of larger planktons and other taxons in the ballast intake stream without creating any chemical or thermal residuals, and it usually enhances or complements the performance of biocidal treatment systems.[61] Hence, it is proposed as a ballast treatment in shipboard and shore-based applications.[62] Filtration as a form of the physical process of the BWM treatment system is preferred since electrochemical disinfection, for instance, creates numerous so-called disinfection by-products that lead to the formation of diverse compounds that may not be environmentally friendly.[63]

Further, ballast water filtration seems to be the best way to eliminate HAOP and sediments before disinfection treatment, and it is equally essential to meet the USCG standards. It is because many organisms evolved and adapted to a capacity where they can withstand other treatment measures like low dissolved oxygen concentration, desiccation, or toxins.[64] Thus, one will agree that the filtration system has become an integral component of the overall system because of its ability to validate system efficiency and sometimes even successful operation to regulation standards.[65] However, an entirely environmentally friendly BWM system does not yet exist,[66] even though filtration could be considered the most favourable and attractive among other treatment systems but not for related microscopic organisms.

Other Management Systems

Ozone, employed as an oxidant without using chlorinated organic compounds, is one of the other BWM methods. It's a useful treatment that calls for sizable ozone generators on board. Deoxygenation is accomplished by employing inert gas to extract oxygen from ballast water. It works as a partial treatment system. Ballast water heating, deep sea exchange, clean ballast and green biocide technology are other system types for BWM.

Standards for Ships' BWM

In line with the general purpose of the BWM Convention requiring all ships, it applies to and parties to the Convention to carry out BWM, ships undertake two necessary standards to achieve the obligations following *Article 4* of the Convention. They include the ballast water exchange and ballast water performance standards and will be briefly reviewed hereunder:

Ballast Water Exchange (BWE) Standard

BWE standard presupposes the practical method to minimize the introduction of unwanted organisms from the discharge of ballast water.[67] BWE at sea is regarded as an interim measure. On the one hand, ballast water exchange means that the exchange of ballast water in mid-ocean or open seas (at least 200 nautical miles from the nearest land and in waters at least 200 metres in depth)[68] offers a means of restricting the probability that harmful aquatic organisms and pathogens be transferred in ships' ballast water.[69] The requirement for this is that ships shall do so with an efficiency of 95% volumetric exchange of ballast water, and ships using the pumping-through method, pumping three times shall be deemed within the standard.[70] This method involves pumping open-ocean water into a full ballast tank and enhances effectiveness in eliminating aquatic organisms. Applying this flow-through method does not alter the stability, stress, and

ship attitude.[71] Other methods include a sequential method and a dilution method.- generally considered pump-through methods that entail emptying ballast tanks and refilling with open-ocean water. The hallmark of this standard-setting implies that during a voyage, mid-ocean ballasting and de-ballasting activities are carried out with the aid of water pumps.[72] The safety of the vessels, time-frame for compliance, and crew members are also considered.[73]

Ballast Water Performance or Treatment Standard

On the other hand, ballast water performance or treatment standards by Regulation D-2 of the BWM Convention require that vessels conducting ballast water management discharge certain viable organisms as stipulated therein. Any ballast water management system is required to meet the D-3 standards and D-3 conditions, including the safety, environmental acceptability, practicability and biological effectiveness of the systems in use.[74] Kim asserted that some ballast water performance methods to eliminate aquatic organisms include physical solid-liquid separation methods to eliminate larger organisms or a combination of disinfection methods.[75] Common methods used to comply with these standards, as discussed above, include Filter and U.V. – (systems filter the particulates and more significant organisms followed by U.V. disinfection); Filter and electrolysis – (systems filter the particulates and the bigger organisms followed by injection of active substances generated from the electrolysis); Ozone – Disinfection through injection of ozone(O_3). Filter and chemical injection – (systems filter the particulates and the bigger organisms followed by injection of a chemical solution).[76]

In compliance with the BWM Convention, a vessel will require an International Ballast Water Management Certificate. To obtain this, a ship must have:

- An accepted ballast water management plan that provides details on how compliance will be accomplished with the required procedures.[77]
- Special documentation on the ballast water treatment system.
- A ballast water record book must be on board the vessel for at least two years after the last record has been made and held by the shipowner for at least three years.[78]

A vessel will undergo an initial survey, and the certificate should be valid for five years, subject to annual reviews and an intermediate survey in the second or third year.

Following the entry into force in 2017 of the BWM Convention, vessels whose keels are laid on or after September 08 2017, must comply with the D-2 standard. However, a transition period will exist that allows existing vessels using the D-1 method -ballast water exchange- as the method of compliance to continue this way. During ratification, existing ships had to comply until the next IOPP (International Oil Pollution Prevention Certificate) renewal survey. After this IOPP renewal survey, the vessel must meet the discharge standard D-2 by using a type-approved treatment plant. However, a proposal to delay the requirements for fitting these treatment systems on existing vessels until 2019 was accepted at MEPC 71.[79] Amendments were approved to regulation B-3, which revised the installation schedule for new and existing ships. Therefore, the adoption of all the required Guidelines for the uniform implementation of the BWM Convention and the approval and certification of new ballast water treatment technologies have removed the significant barriers to the ratification of the instrument, and some additional countries have indicated their intention to accede to the Convention soon.[80]

STATES' OBLIGATION UNDER THE BWM CONVENTION

Owing to the development of the modern law of the sea and the growing concerns for protecting the marine environment, many legal regimes have addressed the resultant problems of pollution, loss of biodiversity and marine conservation.[81] The Marine Environment Protection Committee (MEPC) of the IMO, which

consists of all Member States, is empowered to consider any matter within the scope of the Organization (IMO) concerned with preventing and controlling pollution from ships.[82] In particular, it is concerned with adopting and amendment conventions and other regulations and measures to ensure their enforcement. It was first established as a subsidiary body of the Assembly and later raised to full constitutional status in 1985.[83] Further, the Marine Environment Protection Committee (MEPC) addresses environmental matters under IMO's remit. It covers the control and prevention of ship-source pollution covered by the MARPOL treaty, including oil, chemicals transported in bulk, sewage, garbage, and emissions from ships, including air pollutants and greenhouse gas emissions. Other themes covered include ballast water management, anti-fouling systems, ship recycling, pollution preparedness and response, and identification of special areas and particularly sensitive sea areas.[84] Again, IMO has been at the fore of the international effort by leading in addressing the transfer of invasive aquatic species (IAS) via shipping. In 1991, the MEPC adopted the *International Guidelines for preventing the introduction of unwanted aquatic organisms and pathogens from ships' ballast water and sediment discharges*[85] as a starting point for necessary standard-setting for shipowners against the transfer of IAS. Hence, the specific obligations of the relevant parties will be reviewed hereunder.

General Maritime Obligations for Environmental Protection

Given the above, states are obliged under maritime laws and regulations to protect and preserve the marine environment.[86] This obligation flows from one of the significant objectives of the United Nations Convention on Law of the Sea (UNCLOS), which encourages states' parties to pursue measures to enhance the prevention, reduction, and control of marine pollution.

Part XII of UNCLOS distinctly focuses on protecting and preserving the marine environment in addition to principles and rules on environmental protection contained in other provisions of the Convention.[87] For instance, the Convention authorizes coastal states to adopt some laws regarding innocent and transit passage through territorial seas, straits, and archipelagic sea lanes to preserve the environment of the coastal state and prevent, reduce, and control pollution.[88] Also, it provides for coastal states' jurisdiction subject to the Convention concerning the protection and preservation of the marine environment of the exclusive economic zone.[89] Thus, this is based on the understanding that states have the sovereign right to exploit their natural resources under environmental policies. Still, while doing so, there is a corresponding duty to protect and preserve the marine environment.[90]

Further, *Article 194* of UNCLOS elaborates on the measures required of states to prevent, lessen, and control pollution of the aquatic environment from any source.[91] State parties are also mandated not to transfer damage or hazards or transform one type of pollution into another and should reduce the use of technologies for the introduction of alien or new species, which may have a significant and negative impact on the marine environment.[92]

Hence, these general obligations, according to Sands, serve as the basis for more detailed standards supplemented by procedural obligations to effect the requirements of global and regional cooperation.[93] In this regard, states in pursuance of *Article 197* of UNCLOS are also required to cooperate on a global basis and, as appropriate, on a regional basis, directly or through organizations (in this context, the IMO) in elaborating international rules standards and recommended practices and procedures consistent with the Convention for the security and conservation of the marine environment. Thus, the high standards in the IMO ship safety and security conventions contribute to pollution prevention.[94]

Therefore, the measures for implementing the substantive rules and standards to ensure compliance include notification of imminent or actual damage (*Art. 198*, UNCLOS); having contingency plans against pollution and scientific research (*Arts. 199-200*, UNCLOS); providing technical assistance (*Arts. 202-203*, UNCLOS); the monitoring and conducting of environmental impact assessment of specific activities (*Arts.*

204-206 , UNCLOS); and so on. There is no doubt that the UNCLOS has contributed to the enormous development of international environmental law, especially in the areas of marine protection and preservation. Therefore, the freedom of states to pollute the marine environment, according to Sands, is "no longer unrestrained and the obligation to develop specific rules to give effect to the general obligations of the UNCLOS is enhanced"[95] in addition to its relationship with other legal regimes.[96]

On the focus of this research, there is a general obligation under the BWM Convention, which, among other things, mandates parties to undertake to give complete effect to the provisions of the BWM Convention and its Annex to prevent, minimize and ultimately eliminate the transfer of HAOP (IAS) through the control and management of ships' ballast water and sediments.[97] The obligation under the BWM Convention's general objective is to ensure the parties' efficient application of the Convention. More so, parties are given the right to take, separately or jointly with other parties, more severe measures consistent with international law to achieve the objective[98] and shall endeavour to cooperate for effective implementation, compliance and enforcement of the BWM Convention.[99] Given this, the specific obligations of both the port (coastal) and flag states will be reviewed for a clearer understanding.

Port State Obligation under the BWM Convention

Port State refers to the state with the authority to control foreign vessels voluntarily entering their national jurisdiction by confirming the vessel's condition and equipment.[100] Control at the instance of a port state presupposes the inspection of foreign ships in national ports of a party to verify that the conditions of the vessel and its equipment comply with the requirements of the national/international regulations and that the ship is manned and operated in compliance with those rules.[101]

The UNCLOS, in *Articles 218 and 219* concerning enforcement obligation, establishes that port state should take administrative measures to prevent the sailing of a vessel which has been found to violate applicable international laws and standards relating to the seaworthiness of vessels and thus portends damage to the marine environment. *Article 5(2)* of MARPOL also establishes the basic principles governing the port state's control and detention of foreign vessels.

Under *Article 5* of the BWM Convention, the member states' ports and terminals shall ensure adequate sediment reception facilities where cleaning and repair of ballast tanks take place. These reception facilities must comply with the G1-Guidelines[102] to provide safe disposal of ballast sediments. Besides, parties must notify the IMO where the reception facilities are inadequate.[103] Furthermore, parties shall communicate to the IMO the information on the facility's availability and location. Guidelines-G1 invite parties to provide the reception facility for ballast water sediments. This Guidance directs and encourages building a worldwide uniform system among such facilities and vessels.[104]

However, still under the BWM Convention, a ship to which it applies may be subject to inspection by the port state (in any port or offshore terminal of the state) to decide whether the ship complies with the Convention (BWM) only to the extent of verifying that there is on-board a valid certificate, an inspection of the ballast water record book, and a sampling of the ship's ballast water;[105] although there are certain excepted circumstances that require detailed inspection.[106]

Also, in relation to port state obligations, *Article 8* of the BWM Convention requires that sanctions be established for violating the Convention. In contrast, *Article 10* provides for warnings, detentions, and exclusions. It sets out control actions that a party shall take if a ship threatens the environment, human health, property, and resources. *Article 11* states the need for mandatory notifications where a sanction, detention, warning, exclusion, or control action has been used.[107]

Thus, it is the overall obligation of port state control or other designated authorities to ensure adequate

control and, when required, inspection of ballast water record books and management practices.[108] By Resolution MEPC 252 (67), the IMO developed the Guidelines for Port State Control under the BWM Convention[109] intended to establish compliance with the requirements and not to limit the rights port states have in verifying the Convention. Hence, the underlying principle of Port State Control procedures is that sampling and analysis of ballast water managed on-board a vessel will not be more stringent than what is currently required for the scope of type approval.[110]

So, the Port State Control procedure[111] , according to the Guidelines, can be described as a four-step inspection thus:

- The first stage – the "*initial inspection*", should focus on documentation and ensuring that an officer has been nominated for ballast water management on board the ship and to be responsible for the BWM systems and that the officer has been trained and knows how to operate it;
- The second stage – is the "*more detailed inspection*", wherein the performance of the BWM system is checked, and the PSCO clarifies whether the BWM system has been operated adequately according to the BWM plan and the self-monitored operational indicators verified during type approval procedures. Undertaking a detailed inspection is predicated on the conditions of *Article 9(2)* of the BWM Convention;
- The third stage – sampling is envisaged to happen during this stage of PSC, which relies on indicative analysis to ascertain whether the ship is meeting the ballast water management performance standard described in regulation D-2 or whether a detailed analysis is necessary to ascertain compliance and
- The fourth stage, if necessary, incorporates detailed analysis to verify compliance with the D-2 standard.

Thus, if a ship is found to violate the BWM Convention, the PSC officer may take steps to warn, detain or exclude the ship or grant such ship permission to leave to discharge ballast water elsewhere (such as a designated BWE area) or to undertake repairs. In exercising such functions, the PSC officer should use professional judgment to ascertain whether to detain the ship until any noted deficiencies are corrected or to permit the ship to sail with deficiencies which do not pose an unreasonable threat of harm to the marine environment.[112]

Following the above, it is paramount to note that to verify compliance with the D-2 discharge standard, two tiers of analysis are to be used: An Indicative and a Detailed Analysis. First, as stated above, the examination of the documents and certificates combined with a deck or engine room walk of Port State Control Officers. Secondly, an expanded inspection is necessary in case clear grounds exist that the vessel does not comply with international standards and regulations.

- The Indicative Analysis compliance test is a relatively quick, indirect or direct measurement of a representative ballast water sample. It might use naked-eye counting, stereo microscopy, photometry or measurement of certain chemical substances depending on the size of targeted organisms.[113]
- The Detailed Analysis is a compliance test that is likely more complex than the indicative analysis involving direct measurement of a representative sample to determine the population of viable organisms in ballast water.[114] Not only should the measurement be directly comparable with the limits of the D-2 standard, but it must also be of adequate quality and quantity to measure the concentration of organisms precisely with an equally sufficient detection limit.

As recommended in the IMO G2-Guidelines for Sampling of Ballast Water, the samples must be obtained from the discharge line, as near to the discharge source as practicable, during the actual discharge of ballast water.[115] Grab sampling from a ballast water tank is limited only for an indicative analysis due to the high sample error.

The existing sampling orders can be divided into two distinct categories: (a) taking a specific number of equivalent volumes of samples over a period and (b) continuous sampling based on flow integration over a period that can be accomplished by either taking a small amount of sample during the whole duration of the discharge or taking various samples over specific periods (that is every 10 minutes, etc) frequently throughout the discharge.

It is evident that in the case of detailed analysis, the time between sampling and the end of the analysis might be considerable. Port State Control must be expeditious, should not interfere with the vessel's safe operation and must be conducted responsibly against the seafarers working on-board.[116]

Nevertheless, as is consistent with all IMO conventions, the operational requirements of the Ballast Water Convention would constitute a new field of ship inspections.[117] Port State Control is a right; however, it is an obligation of coastal states to exercise upon foreign-flagged vessels. The practical way for a shipowner to ensure that his vessels will always comply during inspections without being charged with deficiencies or detained is to have a reliable treatment system fitted on-board.[118]

In a nutshell, port state obligation can be highlighted as follows:

- Port/coastal states are expected to enact domestic laws to make the Convention applicable in areas under their jurisdiction, including penalties and sanctions adequate in severity to discourage violations.
- Port/coastal states must establish a CME system, including procedures for inspecting vessels entering their ports consistent with the BWM Convention.
- Ports and terminals where ballast tanks are cleaned or repaired must have adequate facilities for sediment reception.
- States must notify IMO and other Parties of their national requirements and procedures for Ballast Water Management, including the location of reception facilities and any requirements for ships unable to comply with the Convention (follow their BWM Plan).
- Coastal States impose more stringent requirements in certain areas where warranted, provided that the IMO and other Parties are notified.

Obligations of Flag States

The concept of flag-state jurisdiction has considerably changed over time. Still, the flag state remains the key player in implementing and enforcing international rules and standards in the international community's interest.[119] The duties of a flag state have been defined through various international conventions and regulations such as the following: the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78)[120], the International Convention for the Safety of Life at Sea (SOLAS), the Convention on International Regulations for Preventing Collisions at Sea (COLREG) 1972, the International Convention on Standards of Training, Certification and Watch-keeping for Seafarers (STCW 78/95), the International Convention on Load Lines (L.L.) 1966, and the 1982 UNCLOS[121] [122]. It is a maritime custom that the foundation of the maintenance of order on the high seas has rested upon the concept of the nationality of the ship and the consequent authority of the flag state over the ship.

It is usually the flag state that will enforce the rules and regulations not only of its municipal law but also international law; hence, a ship without a flag will be deprived of many of the benefits and rights available under the legal regime of the high seas.[123] Thus, the act of conferment of nationality through registration of a ship is within the competence of states, although registration is the only evidence of nationality, and valid registration under the law of the flag state does not preclude an assessment of nationality under international law.[124] Therefore, the competences of flag states have been restricted by the obligation to at least comply with international rules and standards. At the same time, their enforcement powers have been

strengthened, and by conferring upon flag states the obligation to prescribe and effectively enforce laws, regulations, and standards that are no less effective than those generally accepted at the international level, the international community makes use of their legislative and administrative capacities to maintain safety and security at sea as well as to protect the marine environment.[125]

In pursuance of the legal regimes governing the high seas, every state is mandated to streamline the conditions required to grant its nationality to vessels, for the registration of vessels in its region and for the right to fly its flag. As such, the nationality of the ship will depend upon the flag it flies.[126] There is also a requirement for a genuine link [127] between the state and the ship, although it seems controversial and unsettled among states. Nevertheless, the primary responsibility for ensuring that the ships comply with applicable regulations and standards lies with the flag state. Port State Control is not and can never substitute for the proper exercise of flag state responsibility but is regarded as a measure complementary to Flag State Control.[128]

In pursuance of the concern of this research, *Article 2* of the BWM Convention generally enjoins parties, including both port and flag states, to give complete effect to the provisions of the Convention and its Annex to prevent, minimize and ultimately eliminate the transference of harmful aquatic organisms and pathogens via the control and management of ships' ballast water and sediments. It further stipulated that parties can individually or jointly take more stringent measures concerning the intent and purpose of the Convention.[129] The implication is that a liability regime that seems utterly different from that under the Convention might arise at the instance of shipowners and flag states, notwithstanding the requirements that such stringent measures be consistent with international law.[130] In this regard, a flag state is required to ensure that ships to which the BWM Convention concerns and which are authorized to fly its flag or to operate under its authority comply with the requirements of the Convention and the applicable standards and conditions in the Annex; and shall take practical steps to ensure that those ships meet those requirements. [131]

Thus, the obligations of the flag state are briefly shown as follows:

- To guarantee that vessels flying their flag are generally compliant with the BWM Convention.
- Flag States must enact domestic laws and policies[132] to make the Convention applicable to vessels under their authority, including penalties and sanctions sufficient in severity to discourage violations. [133]
- Flag States must ensure that all vessels under their authority have a Ballast Water Management Record Book[134] and Certificate, both of which must be made available to port authorities on request. Further, on each vessel, an officer is designated to guarantee compliance with the BWM Plan and report to port authorities.[135]
- Flag States must ensure that crew members engaged in BWM and Supplemental BWM practices are adequately trained in implementing the BWM Plan and the procedures specific to that ship (generic and specific training).
- The flag State must establish appropriate procedures for issuing the International Ballast Water Management Certificate. This requires a specific initial and interim survey[136] to ensure the vessel follows the Convention requirements. The surveys may be carried out by the flag state or a nominated organization (classification society).

As such, flag states must also comply with the general obligations specified in the UNCLOS to implement the BWM Convention effectively and efficiently. They also need to comprehensively understand the obligations stipulated by both UNCLOS and BWM Convention to ensure effective implementation. Though ship owners are mainly liable for their ships' safety and protection of the environment, regulating shipping is a significant component of flag states' efforts to ensure ships' safety and pollution prevention.[137] [138]

Non-state Parties' Obligation

As pertains to non-parties to the BWM Convention, *Article 3(3)*, which restates *Article 5(4)* of the MARPOL Convention, stipulates that parties shall also apply the requirements of the BWM Convention to ships of non-parties as necessary to ensure that no more favourable treatment is given to such ships. However, the expression "more favourable treatment" is not peculiar to customary international law; instead, it refers to the non-discriminatory treatment of non-parties ships under the BWM Convention.[139] Apart from the MARPOL Convention, the UNCLOS equally emphasizes the importance of non-discrimination of ships, wherein it provides that "in exercising their right and discharging their duties under the Convention, states shall not discriminate in any form or in fact against vessels of any state."[140] This implies that notwithstanding the provisions of the BWM Convention concerning the obligations of the flag and port state, a basic fact is that when a ship belongs to a non-party to the Convention, the port state party has the right to institute proceedings under its national law.[141] The essence of this is entirely permissible, that is, to ensure that non of the key players (maritime states) with maritime stakes and impact on the marine environment are exonerated from the obligations under the maritime regulations, especially the BWM Convention and the MARPOL Convention else, it might lead to differential treatment measures and lack of commitments of the state parties.

Role of IMO and other Related Administration

The IMO is a specialized agency of the United Nations. It is a global standard-setting authority for the safety, security and environmental performance of international shipping. Its principal role is to create a regulatory framework for the shipping industry that is fair and effective, universally adopted and implemented, in addition to creating a level playing field so that ship operators cannot address their financial issues by simply cutting corners and compromising on safety, security and environmental performance. IMO is a technical organization; most of its work is carried out in some committees and subcommittees. The Organization is committed to working through its member states and partners to develop, maintain, and implement global regulations to guarantee shipping's sustainable use of the oceans.[142] Also, the role of IMO is to adopt legislation concerning maritime safety, the efficiency of navigating and prevention and control of marine pollution from ships, including the designation of particularly sensitive sea areas.[143] Again, it has a distinctive process of expediting the enactment and amendment of international legal instruments to prevent marine pollution from ships. The actors who influence the process of IMO law-making are also diverse, including state and non-state actors.[144]

However, under the BWM Convention, the IMO and the Administration are defined under Article 1. Among the plethora of roles, IMO plays include providing technical assistance and cooperation either individually or regionally with the Administration concerning the control and management of ships' ballast water and sediments and support for training of personnel and ensuring the availability of relevant technology equipment and facilities and other relevant actions aimed at the effective implementation of the Convention and its Guidelines.[145]

It is an information communication hub between the parties and relevant bodies.[146] Meanwhile, the Administration, amongst other things, is responsible for approving BWM plans for shipowners[147] subject to IMO's Guidelines. The IMO is also saddled with reviewing ballast water performance standards while considering the environmental acceptability, practicability, compatibility, cost-effectiveness, and biological effectiveness of such standards.[148] It is also the responsibility of IMO through its Marine Environment Protection Committee to issue specific technical guidelines, which, so far, more than fifteen (15) have been released in pursuance of the BWM Convention.

Hence, it is the overall duty of the IMO's MEPC and the Administration to approve BWM systems for a

type-approval[149] subject to IMO's Guidelines and in addition to a host of other related roles under different international legal regimes or instruments that are beyond the scope of this research.

REGULATORY PRECAUTION FOR FLAG STATES AND DIFFERENTIAL APPROACH

Since state parties and even non-state parties[150] are required to implement the requirements of the BWM Convention and as well take proactive measures that are more stringent, this has created certain differential practices and treatment of sea-going vessels that seem at variance with IMO's regulations. The U.S. and some states within the Union have taken some measures that will be analyzed hereunder, with some obtainable practices under the legal regimes of some developing nations, including the People's Republic of China. The reason for selecting these states is based on the fact it will help to highlight the different legal regimes adopted by them, especially as it relates to the U.S., whose legal measures are quite at variance with IMO's.

Also, because of the role of China globally as a dominant stakeholder in shipping and global trading, it is worthwhile to grasp the legal status quo as far as BWM is concerned for flag states equally. Other states like Australia, Canada, New Zealand, South Korea and Nigeria have also taken some unilateral measures on BWM regulation but are primarily following IMO's regulation; hence, the choice of Nigeria is to reflect the efforts of the GloBallast Partnerships[151] in assisting developing economies in BWM.

Legal Liability of Flag States under the BWM Convention

As noted above, the flag of a ship has, from earliest days, provided an indication of that vessel's nationality – the country under which it derived its legal status and whose laws applied to its operations and, in practical terms, necessary to fly a flag which was a visible indication of the state under whose control that ship operated, backed up with the papers which would be carried by ship.[152] Nevertheless, flag states are provided with extensive powers of oversight and control of the safety of ships flying their flags as well as their liabilities, with specific duties for the inspection of their vessels, jurisdiction and administration of the owning entities, the master and officers and crew of the ship. They are required to provide "their" ships with appropriate certificates that show that the ship has been scrutinized and complied with international rules and standards.[153] The flag state is also firmly in control of criminal and disciplinary powers with the duty to enforce penal authority where there have been breaches of regulations that have led to incidents such as collision, stranding or pollution wherein, in such cases, it is required to respond to reports of violations involving ships flying its flags, institute proceedings and to inform the informing state of its action.[154]

Ideally, the hallmark of responsibilities and obligations laid down by international law and conventions ought to ensure a practical global regime that exercises adequate controls on maritime standards. However, the incapability of such flag states, together with the challenge of ascribing liabilities to a single-ship company registered in an unhelpful state, convinced coastal states that there was a necessity for a means of guarding themselves and their citizens against the threats represented by substandard ships.[155] This informs the need for the port state to play certain roles equally as well.

On the issue of liability, which is another fundamental concern of this research, it is pertinent to note that the general principles of international law imposing liability on actors for their unlawful acts or the adverse impacts of their lawful activities are well settled, as reflected in the Articles on States Responsibility for Internationally Wrongful Acts (ARSIWA).[156] State liability for environmental damage is predicated on a breach of an international legal obligation established by treaty, a rule of customary international law, or possibly under general principles of international law.[157] Liability for environmental damage seems to be evolving. In the context of the marine environment, various Conventions encourage the development of

liability and compensation rules. Hence, it is unclear how the liability of states, especially flag states, will be considered in pursuance of the BWM Convention regarding harm resulting from IAS. However, confronted with the need to have funds available in the event of an oil spill, states decided to levy a fee on all oil shipments to raise revenue for an emergency fund. A similar approach, according to Jenkins, could work to create a fund to pay for rapid response to biological pollution problems (IAS) or, better yet, to prevent them in the first place.[158] This will be partly the concern of this research as it pertains to flag state liability.

The fact that the flag state has primary and possibly exclusive jurisdiction over all ships flying its flag on the High Seas is quite undisputed; neither is the predominant authority of the flag state.[159] However, views and state practices, according to Sucharitkul, seem to be at variance with the nature and extent of the flag state's responsibility regarding the activities of sea-going vessels flying its flag.[160] It is further noted that the issues of liability of tanker on the part of the flag state are borne out by state practice wherein the Fund Convention[161]showed a high degree of consciousness on the part of maritime states and seafaring nations of the duty of the flag state to guarantee that tankers flying their flag comply with international standards on safety and best practice.[162]

In the same perspective concerning the BWM Convention, the flag state is prohibited from violating the requirements of the Convention.[163] In any case, where otherwise, the flag state is deemed liable for such violation, and it is equally mandated to establish a provision for sanctions under its laws.[164] It can do this through investigation and taking of proceedings regarding the alleged violation and ensuring that such sanctions are adequate in severity to discourage violations of the Convention.[165] Such adequacy reflects the PCIJ opinion in the *Factory at Chorzow Case*, where it was held that "the breach of an engagement involves an obligation to make reparation in an adequate form."[166] It further held that reparation must, as far as possible, wipe out all the effects of the illegal act and re-establish the status which would, in all probability, have existed if that act had not been perpetrated.[167] A similar decision reflects the need for ecological restoration as a part of reparations.[168]

The import of this is that the flag state has the first and primary duty to impose liability on vessels flying its flag where there is a violation of the BWM Convention. Thus, under international law, this engages the responsibility of such flag state itself since a ship's flag accrues rights and duties to the flag state. While recognizing this position, the International Tribunal for the Law of the Sea, in its Advisory opinion in *Request for Advisory Opinion submitted by the Sub-Regional Fisheries Commission (SRFC), Advisory Opinion (Case No. 21)*, noted the applicability of relevant rules of international law on the responsibility of states for internationally wrongful acts concerning flag state liability and held that;

The liability of the flag state does not arise from a failure of vessels flying its flag to comply with the laws and regulations of the SRFC Member States concerning IUU fishing activities in their exclusive economic zones, as the violation of such laws and regulations by vessels is not *per se* attributable to the flag State, the liability of the flag state arises from its failure to comply with its "*due diligence*" *obligations* concerning IUU fishing activities conducted by vessels flying its flag in the exclusive economic zones of the SRFC Member States and the SRFC Member States *may hold liable the flag state of a vessel conducting IUU fishing activities in their exclusive economic zones for a breach, attributable to the flag State, of its international obligations.**[169]***

Again, such liability of flag state also extends to inspection of ships of flag states according to *Article 9* of the Convention (BWM) since by its *Article 8(2)*, any violation of the requirements of the Convention *within the jurisdiction of any party* shall be prohibited and sanctions shall be established under the law of that party. It means that both flag and port states may exercise jurisdiction over an erring vessel, notwithstanding its nationality. Still, it seems the flag state's determination of liability over vessels flying its flags pre-empts others' jurisdiction in most cases. *Article 10(2)* of the Convention underscores this view, notwithstanding that all parties (both flag and port states) are urged to cooperate in detecting violations and

enforcing the provisions of the Convention. It is fairly understandable since, by customary state practice codified in UNCLOS, there is a clear intent that a flag state effectively exercises jurisdiction and control in administrative, technical and social matters (amongst other things) over ships flying its flag[170] and under the BWM Convention, nothing shall prejudice the rights and obligations of any state under the customary international law as reflected in the United Nations Convention on the Law of Sea.[171]

In all, compared to the BWM Convention under *Article 8(3)*, which calls for severe sanctions, the sanctions set out in the UNCLOS are arguably weak[172], where a flag state does not comply with its obligations. The possible remedy is to make a normal reporting by other states to the flag state or even exert greater pressure on flag states, especially flag states of convenience, that do not live up to their responsibilities under UNCLOS[173] or engage the liability or responsibility of the flag state as upheld by ITLOS in the above Advisory Opinion wherein it stated that concerned states "*may hold liable the flag state* of a vessel conducting IUU fishing activities in their exclusive economic zones for a breach, *attributable to the flag state, of its international obligations.*"[174]

Regulatory Regimes of the USCG and the EPA

United States Coast Guard (USCG) Regulations

Even though the U.S. is not a party[175] to the BWM Convention, as noted earlier, the Convention also requires non-state parties to give effect to the Convention, especially regarding ships of non-parties or ships flying its flag. In this regard, the USCG in 2012, by its Regulations, established distinct ballast water standards for approved concentration of living organisms in ballast water discharge from ships into the waters of the U.S. and required that any organisms dumped into their waters *"be already dead"*. In contrast, IMO refers to "*viable*" organisms, meaning those who cannot survive the transition or are unable to reproduce in the new environment.[176] The USCG regulates ballast water discharges under the authority of the Non-Indigenous Aquatic Nuisance Prevention Control Act[177] (NANPCA) and the National Invasive Species Act[178](NISA). The final rule adopted as the federal ballast water discharge standard is the "D-2" standard in the IMO BWM Convention. This standard was adopted after the Coast Guard, EPA, and multiple scientific advisory panels determined that it represented the most environmentally protective standard that could be achieved using commercially available shipboard ballast water treatment technologies. It stipulated several modalities for commercial vessels operating in U.S. waters to manage their ballast water.[179]

The Coast Guard's final rule requires vessels discharging ballast water in the United States to be equipped with U.S. Coast Guard type-approved treatment technologies meeting the D-2 standard and to treat the ballast water with U.S. type-approved ballast water treatment technology based on the view that the use of an IMO type-approved technology will not meet the U.S. requirements.[180] It explained in its final rule that it adopted its own, arguably more rigorous, type approval protocol due to concerns about the efficiency of the IMO type approval process to demonstrate that systems meet the D-2 treatment standard. Similar to the IMO type approval regime, the USCG Regulations require that the systems be tested in both land-based and shipboard testing environments and that testing be performed by an independent laboratory (the laboratory cannot be affiliated with vendors), requires that all test runs—failing and passing—be reported, contains explicit procedural instructions concerning how the testing is to be conducted and requires that every system evaluations be subject to a quality assurance/ quality control evaluation.[181] The Coast Guard-approved independent laboratories include NSF International and DNV, each operating multiple test facilities.[182]

However, the Coast Guard's final rule allows a non-US (IMO's) type approved system to meet the U.S. requirements for up to five years from the vessel's compliance date if that system has been designated an alternate management system (AMS) for the U.S. Coast Guard.[183] Where an installed AMS does not gain

U.S.-type approval before the five-year term elapses, the ship will no longer be able to utilize that system to achieve compliance with U.S. regulations. It will need to be retrofitted with an approved U.S.-type system. The USCG noted that an AMS designation in no way indicates that a system will ultimately be U.S. type approved since AMS designation is merely a determination, based on current IMO type approval, that the system is equivalent to ballast water exchange.[184]

Hence, the USCG accepted its first type-approved BWM system- Optimarin's BWM system and later Alfa Laval Tumba AS's Pure Ballast 3 and Ocean Saver AS's ballast water treatment system MKII, wherein all the three systems comply with IMO type approval.[185] Other types of current approved systems include:

Marine Safety Center
BWMS Type Approval Status

Approved						
Application Received	**Manufacturer (Country)**	**Model**	**Independent Laboratory**	**System Type**	**Capacity**	**Certificate Issued* (Amended)**
9-Oct-2020	TeamTec BWMS AS (Norway)	Senza BWMS	DNV	Chemical Injection	375 – 3,750 m^3/h	11-Feb-2021 (Pending)
28-Sep-2020	SKF Marine GmbH (Germany)	SKF BlueSonic BWMS	DNV	Filtration + Ultraviolet + Ultrasound	100 – 1,500 m^3/h	14-Apr-2021 (07-Apr-2022)
30-Dec-2020	Wuxi Brightsky Electronic Co. (China)	BSKY	KR	Separation + Ultraviolet	80 – 6,000 m^3/h	27-Apr-2021 (28-Feb-2022)
7-Jun-2019	Evoqua Water Technologies Ltd. (United Kingdom)	SeaCURE	PIA	Filtration + Electrolysis	500 – 6,000 m^3/h	08-Jun-2021 (15-Jun-2023)
31-May-2021	Jiangsu Nanji Machinery Co. Ltd. (China)	NiBallast	DNV	Filtration + Deoxygenation	100 – 4,000 m^3/h	10-Sep-2021 (06-Sep-2023)
23-Apr-2021	Hyundai Heavy Industries Co., Ltd. (Republic of Korea)	HiBallast NF	KIOST	Electrolysis	75 – 10,000 m^3/h	27-Oct-2021 (31-Oct-2021)
27-Jul-2021	RWO GmbH (Germany)	CleanBallast-OBS	DNV	Filtration + Electrolysis	500 – 3,000 m^3/h	16-Dec-2021
3-Jun-2021	Norwegian Greentech AS (Norway)	NGT BWMS	DNV	Filtration + Ultraviolet	27 – 609 m^3/h	24- Feb-2022 (8-Jan-2024)
10-May-2021	Atlantium Technologies Ltd. (Israel)	Purestream	LR	Filtration + Ultraviolet	100 – 1,500 m^3/h	21-Apr-2022
31-May-2022	Langh Tech Oy AB (Finland)	LanghBW	DNV	Filtration + Ultraviolet	300 – 600 m^3/h	16-Sep-2022
3-Jun-2022	AQUASTAR Co., Ltd (Republic of Korea)	AquaStar	KR	Electrolysis	200- 5,000 m^3/h	7-Nov-2022
16-Mar-2023	Shanghai Electric Cyeco Environmental Technology Co., Ltd (China)	Cyeco	DNV	Filtration + Ultraviolet	100- 1,600 m3/h	21-Jun-23

Current list of type approved Ballast Water Management Systems / Credit: USCG[186]

Thus, by the USCG Marine Safety Information Bulletin (MSIB), 2017, shipowners are reminded of the need for compliance with the US BWM Regulations irrespective of the vessel's status under the BWM Convention and compliance under the IMO type approval. It implies that under the US BWM Regulations, the USCG can grant an extension of a vessel's compliance date to a shipowner who has documented that despite all efforts, compliance with one of the BWM systems is not tenable.[187] In this regard, the shipowner will need to show evidence of unavailability of the USCG type-approved system at the time of application for extension, and the time of compliance date extensions will be based on the availability of the USCG type-approved system, amongst other things.[188]

The Environmental Protection Agency (EPA)

As regards the EPA, the discharge of ballast water in U.S. waters also comes under the National Pollutant Discharge Elimination System (NPDES) of the Clean Water Act based on a court order vacating a 35-plus year vessel exemption from Clean Water Act (CWA) requirements, thereby empowering the U.S.

Environmental Protection Agency (EPA) to adopt the first "Vessel General Permit" (VGP) in 2008 demanding commercial vessels of 79 feet or more to obtain CWA National Pollutant Discharge Elimination System (NPDES) permits for most ship discharges, including ballast water.[189]

It issued the Vessel General Permit (VGP) in 2008, 2013, and recently in 2018[190]. It provides for the National Pollutant Discharge Elimination System (NPDES) to permit coverage for incidental discharges from commercial vessels of all sizes into U.S. waters. The 2013 VGP allows shipowners to obtain permit coverage by notice of intent (NOI) for vessels equal to or above 300 gross tonnes and *permits authorization and record of inspection* (PARI) for vessels less than 300 gross tonnes.[191] The EPA in 2013 also adopted the same ballast water treatment standard and implementation program as the 2012 U.S. Coast Guard final rule. The VGP also contains specifications for vessels treating their ballast water to perform regular monitoring of the system functionality, equipment calibration, indicator organisms in the treated effluent, and residual biocides (for systems employing biocides to treat the water).[192] It does not grant extensions to the implementation schedule if U.S.-type-approved ballast water treatment technology is not accessible by the vessel's compliance date; thus, in December 2013, the EPA published an enforcement response policy letter noting that the agency will consider vessels that have obtained a compliance extension for the U.S. Coast Guard a 'low enforcement priority."[193]

These requirements equally affect flag states and shipowners since satisfaction with international minimum standards is not enough. The 2018 VGP additional requirements for the current VGP include calibration of sensors and periodic sampling of biological indicators and residual biocides.[194]

US States' Differential Approach

Some U.S. coastal states have passed laws regulating ballast water discharges from ships. The problem of having different ballast water treatment standards in different U.S. states is that vessels in U.S. international commerce call at various states in a single trip and cannot simply swap out one ballast water treatment system for another as they move from jurisdiction to jurisdiction.[195] Some of the states are shown below.

State of California

The State of California, for instance, has its BWM standards, which will be even stricter than those of the USCG. California's "*Interim Performance Standards*" for BWM systems is to come into effect on 1 January 2020 because of a lack of available technology to meet the standards, hence the delay in the compliance schedule for installing ballast water treatment technology until 2020. However, the California State Land Commission has adopted regulatory amendments to implement the federal ballast water discharge standards for vessels arriving at California ports, among other provisions. These changes become effective on January 1, 2022. These amended regulations:

- Incorporate the federal ballast water discharge standards and implementation schedule into California law (2 CCR Section 2293 (a)).
- Delay the compliance dates for the existing interim and final California ballast water discharge performance standards to 2030 and 2040, respectively (2 CCR Sections 2293 (b) and (c)).
- Establish operational monitoring and recordkeeping requirements for vessels that use a ballast water treatment system to meet ballast water discharge performance standards (2 CCR Sections 2295 and 2297).
- Authorize Commission staff to collect ballast water and sediment samples for research purposes and compliance assessment (2 CCR Section 2294).[196]

The California State Lands Commission issued a reminder notice for vessels calling at Californian ports covering the existing reporting requirements relating to BWM. As such, for vessels of more than 300 GT,

ballast water exchange will be made outside the exclusive economic zone (EEZ), at least 200 nautical miles from any shore, and in water depth over 2,000 metres. These examples illustrate the need for an international entity to make global rules and to avoid each country setting its laws, with the risks that wide diversity incurs.

State of Michigan

The Michigan Department of Environmental Quality (MDEQ) issues Certificates of Coverage (COC) under Michigan's Ballast Water Control General Permit MIG140000. The COCs are issued to owners and operators of oceangoing vessels for both port operations and ballast water discharges in Michigan.[197] The applicability of this permit shall be confined to oceangoing vessels that: a) engage in port operations in Michigan and do not release ballast water into the waters of the state; b) discharge ballast water managed by one or more of the ballast water treatment methods determined by the Michigan Department of Environmental Quality (the Department) to be environmentally sound and effective in limiting the discharge of aquatic nuisance species; or c) have not otherwise been determined by the Department to need an individual permit.[198] By the provisions of Part 31, Water Resources Protection, and Part 41, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA); and Michigan Executive Orders 1991-31, 1995-4, and 1995-18, ballast water is authorized to be discharged from oceangoing vessels specified in individual certificates of coverage (COC) following discharge limitations, monitoring requirements, and other conditions outlined in the general permit.[199] The permit took effect on January 1, 2022, and will expire on January 1, 2027. It should be noted some of the ballast water treatment methods authorized under this permit include Hypochlorite Treatment, Chlorine Dioxide Treatment, Ultraviolet Light Radiation Treatment Preceded by Suspended Solids Removal, Deoxygenation Treatment, and Other United States Coast Guard (USCG) Approved Treatment Technologies.[200]

Concerning responsibility, Section D Paragraph 2 of the Permit stipulates that all discharges authorized therein shall be compatible with the terms and conditions of the permit and the permittee's COC. The discharge of any pollutant identified in the permit and the COC more frequently than or at a level more than that authorized shall constitute a violation of the permit. Hence, a proposed bill requires sterilising all ballast water from outside Michigan before entering the Great Lakes bordering the State. For non-compliance with the rules, fines could reach up to US$25,000 a day, and there may be criminal charges.[201]

Applicable Regulatory Measures in China

Non-native invasive species remain major environmental and ecological problems in China, which have become more severe with increased human activity. In contrast, managing biological invasions is one of the most essential actions to mitigate the problems.[202] However, although eight out of the ten world's largest ports are located in China and huge volumes of ballast water are discharged into Chinese coastal regions, scientific studies and sufficient management are largely missing.[203]

China is one of the top trading nations, yet little is known about alien species in the ballast water of ships reaching its ports.[204] Thus, relevant laws and regulations governing BWM in China include the Marine Environment Protection Law of the People's Republic of China (1999), the Frontier Health and Quarantine Law of the People's Republic of China (1986), and the Regulations of the People's Republic of China on the Prevention of Vessel-Induced Sea Pollution (1983).[205] Ballast water management, especially de-ballasting, is administered by the Maritime Safety Administration, which mainly focuses on hydrocarbon products and dangerous chemicals, with increasing attention being paid to invasive organisms. In contrast, the China Entry-Exit Inspection and Quarantine Bureau controls ballast water management from pathogen-infected regions.[206] The State Oceanic Administration equally plays a crucial role in drafting laws and regulations concerning sea area use, environmental protection, scientific research and island protection in China's internal sea, territorial waters, contiguous zone, exclusive economic zone, continental shelf and

other sea areas.[207]

Following the above, China's current legal regime seems to lack unified standards for BWM. In this regard, while recognizing the insufficiency of China's current environmental legislation on effective management of the problem of the invasion of marine alien species, Bai aptly proposed specific laws regarding the invasion of marine alien species to ensure adequate control and management and minimize the damage to China's marine ecology.[208] It is further contended that such proposed regulation should incorporate some fundamental principles like precautionary principle and polluter-pays principle on the one hand as preventive measures and ecosystem-based whole process management principle and public participation principle on the other hand as instrumental and management measures.[209] These views seem plausible since such legislation will help align China's legal regimes on BWM to international standards while distinctly setting out standards for BWM for vessel operators.

Regarding flag states, it is crystal clear that Article 3 of the BWM Convention applies here to China as both flag and port states are non-party to the Convention. So, satisfaction with minimum IMO standards can avail a flag state and compliance with relevant laws and regulations of China on BWM. Other customary rules enshrined in the UNCLOS are also applicable here. In sum, it seems not to be a serious concern for ships flying Chinese flags or calling at Chinese ports as far as they comply with available international standards, unlike the USCG rules that require more stringent and differential measures.

Developing Countries Perspective- Nigeria

Nigeria signed and ratified the BWM Convention as early as October 2005 and had committed to continuing the implementation of the Convention, taking the lead in the West Africa sub-region, and working closely with its neighbouring countries to share experiences. As of March 2010, Nigeria joined the Lead Partnering Track (LPC), thus becoming the second LPC in the region with Ghana. GloBallast Partnerships LPCs are designated based on a solid commitment to making progress with the BWM Convention's implementation and supporting national and regional activities under the GloBallast Partnerships framework.[210] Its administrative agency- the Nigerian Maritime Administration and Safety Agency (NIMASA),[211] has the authority to regulate and promote maritime safety, security, marine pollution and maritime labour. *Section 22(1)* of the NIMASA Act 2007 saddled the agency with the responsibility of carrying out, among other things, the following activities in pursuit of her statutory functions: Flag State Administration; Port State Control, Administration of Ship Registration, Marine Pollution Prevention and Control.[212]

Regarding BWM and regulation, a Regulation[213] was adopted in 2012 under Nigeria's Merchant Shipping Act 2007[214] to regulate BWM. The Regulation applies to vessels entitled to fly the flag of Nigeria or vessels that operate under the authority of Nigeria, as well as other vessels when in ports and at offshore terminals in Nigeria. Such vessels need to be certified by the NIMASA after a survey is conducted. It adopted IMO BWM standards contained in Regulation B-3 of the Annex to the Convention and the performance standards under Regulation D-2 of the same Annex[215]. The regulation also adopted IMO's guidelines on ballast water sediment management.[216] Also, in this regard, a draft Regulation on ballast water sediment reception facilities[217] provides that every port authority in respect of a port or terminal operator in respect of a terminal to which the Regulation applies shall provide adequate facilities for the reception of sediments from ships using the port or terminal and in assessing the adequacy of the sediment reception facilities provided in its port or terminal the relevant port authority or terminal operator shall have regard to – (a) the IMO Guidelines and the IMO Manual; and (b) any sediment management plan approved in relation to a port or terminal pursuant to Regulation 7 or prepared by the Nigeria Port Authority (NPA) pursuant to Regulation 9.[218]

Concerning strategy, the proposed Nigeria National Ballast Water Management Strategy (NBWMS) is intended and planned to be an integral part of the national regulatory framework, along with relevant

policies, legislation and institutional arrangements.[219] [220] It will contain specific programmes of work and action plans which can easily translate existing national policies or newly developed policies into effective and efficient ballast water management practices that are harmonious with domestic as well as international obligations and legal requirements.[221]Other relevant stakeholders in this regard are the Port Administration- National Ports Authority (NPA), Environmental Administration- Federal Ministry of Environment and Coastal States Ministries of Environment in the Nine coastal states – Lagos, Ogun, Ondo, Edo, Delta, Bayelsa, Rivers, Akwa Ibom and Cross River States.

Hence, the position in Nigeria is not problematic or worrisome to flag states since Nigeria is IMO-compliant and a signatory to the BWM Convention. Therefore, taking extraordinary precautions for flag states is unnecessary so far as there is compliance with the Nigerian laws and relevant regulations that are similar to or *in pari materia* with the IMO regulations.

UNEP Regional Seas Programme

Also paramount in the regulatory precautionary measure for flag states is the United Nations Environment Programme (UNEP) regional seas programme. As part of the obligations under *Article 197* of the UNCLOS, which encourages states to cooperate on a global basis and, *as necessary, on a regional basis, directly or through responsible international organizations*, in formulating and elaborating international rules, standards and recommended practices and procedures, for the protection and conservation of the marine environment, bearing in mind the characteristic regional features; the UNEP Regional Seas Programme was launched in 1974, as one of its most significant achievements in the past four decades.[222]

It aims to address the accelerating degradation of the world's oceans and coastal areas through a "shared seas" approach by engaging neighbouring countries in comprehensive and specific actions to protect their shared marine environment.[223] Today, more than 143 countries have joined eighteen (18) Regional Seas Conventions and Action Plans[224] for the sustainable control and use of the marine and coastal environment in line with Goal 14[225] of the Sustainable Development Goals (SDGs), which emphasizes the protection of life below water among other things. In most cases, the Action Plan is underpinned by a solid legal regime in the form of a regional Convention and associated Protocols on specific problems; all individual Conventions and Action Plans reflect a similar approach, yet its governments and institutions have tailored each to suit their environmental challenges under the UNEP co-ordination.

So, the UNEP Regional Seas Conventions and Actions Plans have emerged over the last 40 years as the world's only legal framework for protecting the oceans and seas at the regional level. It serves as a stage to create regional sustainable development – as called for at the Rio+20 Summit – including the regional implementation of programmes and activities linked to global conventions and MEAs.[226]

IMPLEMENTATION CHALLENGES FOR FLAG STATES

Given the obligations and measures required from flag states, it is inevitable that there are several impediments to realizing such compliance envisaged under the BWM Convention. Hence, there are several challenges that shipowners face, including but not limited to differences between regional or unilateral (US) and global requirements; the complexity and economic cost of retrofitting the systems onto existing bulk carriers; the appropriateness of available methods to meet operational requirements of the ships; whether the systems do what they are meant to do; and post-installation services/support provided by manufacturers.[227] Some of these will be briefly reviewed hereunder.

Legal Challenges

Having appreciated the differential approaches in BWM, compliance with three sets of rules is problematic;

however, the IMO, EPA, and USCG regulations all enforce the same numeric discharge standards, there is substantial variation in the protocols required to meet these standards.[228] Further to possible compliance complications, ship owners must also confront the substantial financial undertaking posed by installing multi-million dollar ballast water management systems (BWMS), which could be rendered obsolete by evolving regulatory programs.[229] It is because, given the cost and risk associated with installing a BWMS without a U.S. Coast Guard-type approval, vessel owners and operators must evaluate their options to maintain regulatory compliance. The USCG stands by its rigorous approval protocol, emphasizing that solid regulation forces innovative solutions.[230] In the US, there is also some uncertainty on the different approaches of the USCG and the EPA. Under the VGP regulations, EPA does not require ships to have a USCG-approved ballast water management system. Instead, they expect a system "which has been shown to be efficient by testing conducted by an independent third-party laboratory, test facility or organization." The result is that if the USCG issued provisions on an extension for compliance, the EPA did not provide a similar extension. It is understood that the EPA regards this as a low priority regarding enforcement if all the other relevant regulations have been met.[231] The overall requirements of the tripartite regimes create an onerous legal task on operators, notwithstanding IMO's requirement that any stringent measure must agree with international law. Therefore, three or four compliance levels are required.

Technical Impediments

Vessels must develop and execute a complete training plan for their BWMS, as these systems are highly technical and complex and need specialized training to ensure that crew members know how to use and maintain them. One of the most significant difficulties they face is selecting the right BWMS for their ships from the six USCG-type-approved systems and approximately a hundred AMSs currently on the market regarding USCG BWM systems. Not all systems are suited for all ships based on the ship's operating pattern, space, and size restrictions. The currently accepted method of compliance is to retrofit BWM systems within the vessel permanently.[232] However, the BWM systems' capital costs, combined with the complexity of installation, dictate the total cost to retrofit. With the BWM systems available on the market, selecting the most suitable system for a particular vessel has become a complex task.[233] This adds additional pressure on facilities regarding retrofitting capacity. The facilities are under pressure to install systems, and BWM systems manufacturers will be under pressure to manufacture the systems and deliver these where and when required.[234]

Again, the uncertainty of ballast water sampling techniques is another technical challenge impeding the implementation of the Convention since the G-2 Guideline is not robust enough for practical use in sampling and analysis methodologies to ensure compliance with the Convention. It calls for a complex and technical procedure to determine the exact level of IAS in ballast water to achieve the D-2 standard.

Economic Implications

Implementing the BWM Convention by a state party involves modification of legislation, policies and institutions. Usually, the steps under the process include an initial national assessment of the status of ballast water-related issues, an economic assessment of resources at risk and cost of implications of ratification of the Convention, the development of national ballast water-related strategy and involving a legislative review implementation.[235] The essence of the economic assessment is to provide an understanding of the economic value of resources that may be under threat of a potential bio-invasion, as well as an estimation of the costs related to precautionary action, which is the implementation of the BWM Convention.[236]

These costs could be categorized as preparatory and compliance costs. At the same time, the preparatory costs refer to the fulfilment of institutional needs and the development of national strategies. In contrast, compliance costs involve commitments to issuing and renewing certificates, survey procedures, approval of BWM systems, training of crew members, and restructuring of the national regulatory regime.[237]

Compliance with the Convention for all ships, both for existing and new ships, according to Kim, requires enormous investment from shipowners, and a BWM system can cost a fortune in addition to costs relating to BWM plans, dry-docking (it was noted that the requirement for vessels to fit a BWM system at their next dry-docking would create an additional and significant cost[238]) and installation.[239]

Regarding type-approval of BWM systems outlined in Regulation D-3 and Guidelines G8, Flag State Administrations may grant type-approval to BWM systems deemed to fulfil the standards set out in the Convention (Regulation D-2). The cost will include establishing a procedure under the Convention and Guidelines G8 and G9. Furthermore, as these are highly technical issues, the Administration may need to build capacity. Costs may also be incurred through a review of the technical documentation and test results of BWM systems before Type Approval Certificates are issued.[240] Also, under Regulation E-1, regular surveys of BWM systems onboard ships should be conducted. This includes initial surveys on installation/approval, surveys for renewal of certificates, as well as Intermediate, Annual and Additional surveys as specified in the Convention. Once standard survey procedures have been set, the main cost is the time spent conducting them as part of routine flag state inspection.[241]

Timeline Compliance Framework

Regulation B-3 of the Convention sets out a timetable for applying two standards of compliance to different categories of ships based on the date of construction of the vessels and the ballast water capacity of the vessels. The ballast water exchange standard is intended to be an interim standard only and was phased out in 2019. Intercargo, while expressing its concerns about the practical problems faced by its members in retrofitting the existing dry bulk ships with ballast water treatment systems (BWTS), noted that a new building vessel case is different from retrofitting an existing vessel. At the same time, a bulker carrier has unique requirements to those of other ship types.[242] This raises some issues with compliance deadlines for shipowners.

Some flag states are offering some solutions to move up the date for the renewal survey for the vessel's IOPP Certificate, which triggers compliance with the Convention, to enable more time to comply; this is a temporary measure that is not a substitute for the consistent global approach to managing ballast water that the Convention intended to bring about.[243] The challenges inherent in retrofitting the BWMS numbers to meet the requirements must not be underestimated; hence, it is now appropriate to reconsider the regulation B-3 timeline pragmatically to enable smooth implementation of the BWM Convention, noted Mishra.[244]

The newly revised implementation schedule now applies to approved BWM treatment systems and specifies the acceptable levels of viable organisms left in ballast water after treatment following the Convention's D-2 standard. For ships constructed before 8 September 2017 and not subject to the MARPOL IOPP renewal survey, compliance with the D-2 standard shall be no later than 8 September 2024. This revised schedule is summarized as follows:

New vessels	Existing vessels where:	For other existing vessels	Existing vessels not required to have an IOPP certificate
Keel laid on or after 8th September 2017:	Completed IOPP renewal survey between 8th September 2014 and 7th September 2017:	Install BWM system at whichever occurs first of the following:	Tankers of less than 150GT and ships other than oil tankers of less than 400GT
Install BWM system upon delivery	Install BWM system at the first IOPP renewal survey on or after 8th September 2017	First IOPP renewal survey on or after 8th September 2019; OR Second IOPP renewal survey on or after 8th September 2017*	Install BWM system not later than 8th September 2024

Source: http://www.nepia.com/news/circulars/international-convention-for-the-control-and-management-of-ships-ballast-water-and-sediments-and-us-ballast-water-management-regulations/

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Therefore, it should be noted that the updated implementation schedule agreed upon at the 71st session of the IMO's MEPC delays the final deadline for compliance with the D-2 discharge standard and the associated fitting of a type-approved BWM system. The agreement does not alter compliance with the Convention's D-1 standard on ballast water exchange or the specifications covering BWM documentation upon entry into force of the Convention on 8 September 2017.

Discussion and Response

There is no doubt that ballast water management is a complex and complicated issue raising concerns about emerging international regulations, ship designs, economic impact, and ecological conservation concerns. [245] As noted earlier, there are various types of treatment systems available or currently in development which work on the principles of one or a combination of mechanical, physical, and chemical, and standard methods, as noted above, including Filter and UV- systems that filter the particulates and bigger organisms followed by UV disinfection; Filter and electrolysis – systems that filter the particulates and the more significant organisms followed by injection of active substances generated from the electrolysis; Ozone – Disinfection through injection of O_3.; Filter and chemical injection – systems filter the particulates and the bigger organisms followed by injection of a chemical solution.[246]

Nonetheless, choosing the right treatment system is not going to be simple and coupled with the insufficient number of currently available treatment systems to achieve, for instance, the USCG type approval, shipowners and flag states have a tough decision to make since there is a tendency that when selecting and installing an IMO compliant system it might not gain type approval by the USCG.[247]

Furthermore, it was decided at MEPC 70 that the IMO G-8 Guidelines on the design, construction, and evaluation process for type approval of ballast water management systems would be updated. The reason behind this revision is that there are concerns the existing guidelines are not robust enough to ensure performance standards are satisfied when the systems are in on-board service. The benefit is that the revised G-8 guidelines will be more aligned with the USCG method, but the downside is that the new guidelines are not expected until October 2018. However, at MEPC 80 on 3-7 July 2023, under the experience-building phase of the BWM Convention, the MEPC approved the Convention Review Plan (CRP), which includes a list of priority issues to be considered during the convention review stage. Such a plan will direct a thorough review of the BWM Convention over the next three years and the development of a package of amendments to the Convention.[248] As such, ships subject to IMO compliance before this date might be forced to fit systems that only satisfy the original G-8 criteria. There is also a technical challenge involving the malfunctioning of the ballast water treatment system onboard ships. According to Bakalar, the performance reliability of specific ballast water treatment systems on-board ships has indicators that should be observed, followed, and analyzed over a more extended period of system exploitation.[249]

More so, there is a substantial difference in discharge standards between the IMO and USCG. Despite the numerical values of the organisms in the IMO and USCG discharge standards being the same, the USCG regulation states that the organisms must be "dead", but IMO refers to "viable" organisms related to their ability to reproduce. Not long ago, there had been concerns that the USCG would not allow UV treatment systems, even those with existing IMO D-2 approval. However, the USCG-type approval of the Optimarin system, which uses UV technology, might ease these concerns. It seems that the USCG will recognize UV systems, but the treatment must 'kill' the organisms. But this demands significantly more power than needed to render the organism unable to reproduce.

In the US, as noted, there is also some uncertainty on the different approaches of the USCG and the EPA. Under the VGP regulations, EPA does not need ships to have a USCG-approved ballast water management system. Instead, they expect a system "which has been shown to be effective by testing conducted by an

independent third-party laboratory, test facility or test organization." This is because when the USCG issued provisions on an extension for compliance, EPA did not provide a similar extension.

Further**,** the IMO BWM Convention states in *Article 8* that a vessel violating the Convention could be subjected to action by both the flag state and the country where it occurred. Penalties and sanctions will, therefore, be decided by the relevant authority. In the United States, federal penalties are addressed in 33 CFR Part 151 (Subpart D) and state that a person who violates it is liable to a civil penalty not to exceed $35,000, and each day of a continuing violation constitutes a separate violation[250]. A ship could be subject to additional penalties imposed by the US state in which the violation occurred. Such practice not only creates liability for flag states but also for shipowners. The implication of this is that non-parties (like the US) to the Convention could create a new liability regime quite distinct from the Convention and even at variance with international law since the US is equally not a party to the constitutive ocean law- the UNCLOS, despite recognition of some of the principles contained therein as customary rules of international law. As such, states, especially the flag states, should pay close attention to the legal regimes in their registered nationality to forestall any liability, notwithstanding compliance with the Convention.

Hence, in a situation where a flag state is liable for its failure to fulfil its obligation to ensure its vessels comply with the coastal state's laws and regulations, the coastal state may request the flag state to, among other things, take necessary measures to comply with its obligation or to make reparation in adequate form against the flag state thereby reflecting the reasoning of the PCIJ in the *Factory at Chorzów Case*.[251] [252] [253]

SUMMARY AND CONCLUSION

Conclusion

This research succeeded in achieving its objectives enunciated above. It highlighted the trending incidences of the impact of invasive alien species (IASs) on the marine ecosystem. It equally established the linkage between international shipping and the phenomena, whereas it is now more evident that ships' ballast water serves as a pathway for the transfer of IAS. Several legal responses were also analyzed, as well as specific ballast water management systems and standards geared at curtailing the increasing prevalence of bio-invasion. The implication and precautionary measures for flag states also come within the contemplation of the research, including several differential practices within the US.

Hence, it is arguable that adopting universal standards and management systems that will be both IMO and USCG compliant is paramount for all interested parties, including flag states and shipowners. Also, incorporating other readily available, less technical and economical ballast water management or treatment systems will equally be favourable while maintaining ecological balance and function in the marine environment. In this regard, Batista *et al.* asserted that using green technologies (green biocides) could efficiently help reduce the release of invasive marine species, which will advance environmentally friendly systems with simple management and maintenance needs.[254] With this in place, in addition to other systems acceptable to both IMO and the USCG, certain technical obstacles and regulatory impediments could be forestalled, mainly in flag states fighting against the transfer of invasive alien species or bio-invasions.

Recommendations

With the Flag States or Administrations faced with situations of how to maintain compliance or system approval for BWM given the *status quo*, both technical and legal, it is recommended as a follow-up of the above discussion that:

- There is a need for further research and studies on developing efficient BWM systems that will be widely approved and active. The basis of the USCG differential measures is asserted on several concerns about the reliability and effectiveness of available technologies used by IMO to determine regulatory compliance. It is agreeable with Batista that to ensure robust, eco-friendly, and cost-effective systems, it is pivotal to develop green and environmentally friendly biocides to attain both the short- and long-term goals of BWM.[255]
- There should be a provision for a baseline survey of ports for specific organisms. It will aid in detecting the variation in the demography of existing HAOPs and will efficiently work in addition to Regulation C-2 of the Annex to the Convention.
- Regional cooperation[256] is encouraged to be strengthened in addition to the UNEP regional seas programme outlined above, as the UNCLOS urges.
- It is also paramount to put in place a fund or compensatory mechanism like the one discussed above for addressing any loss resulting from IAS' transfer in line with the polluter-pays principle.[257] Bai also endorses this view.[258]
- Regarding the USCG, it is pertinent that the US harmonizes its BWM regulatory measures and supports the current international efforts by the IMO. Likewise, the IMO and relevant stakeholders should work closely with the US Administration to find common ground for an efficient system for BWM as a global concern.[259]
- On liability and penalty, it is proposed that the Port State Administration be equally empowered by its national legislation to enforce and determine the liability of unlawful acts of vessels flying its flag and those under its jurisdiction.[260] However, there is a necessity for such sanctions or penalties to comply with the BWM Convention so as not to hamper international shipping. It is recommended that the responsibility of a flag should only be engaged singularly where there is an intentional or negligent transfer of IAS and just if such violation is attributable to the flag state[261] for violation of international environmental standards, including those under the BWM Convention.
- It is desirable to develop a communication network across all stakeholders (manufacturers, ship owners, governments), engage in ongoing discussions as well as develop a strategy to influence positive outcomes reflecting real-world operations, especially as it relates to the conducting of cost-benefit analysis (CBA)[262] of proposed type-approved technologies which will help to mitigate the economic challenges of BWM.

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I dedicate it to lovers of knowledge!

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POSTSCRIPT!

Paper Presentation Questions (in red) and Answers *(in italics)*

- What is the need for a comparative analysis of the IMO and the US regulation of ballast water management (BWM)?

Since state parties and even non-state parties are required to implement the requirements of the BWM Convention and as well take proactive measures that are more stringent, this has created certain differential

practices and treatment of sea-going vessels that seem to be at variance with IMO's regulations. The US and some states within the union have taken some regulatory differential approach measures. The reason for the comparative review is that it will help highlight the different legal regimes they adopted, especially as they relate to the US, whose legal measures are quite at variance with IMO's. It also aims to enlighten flag states on the legal regimes of the key players in the maritime industry globally. ***See more in Section 4(4.2 and 4.3) of the paper****.*

- What should China do concerning ballast water management (BWM)?

China is one of the top trading nations, yet little is known about alien species in the ballast water of ships reaching its ports. Ballast water management, especially de-ballasting, is administered by the Maritime Safety Administration. The current legal regime in China is devoid of unified standards for BWM. In this regard, there is a need for specific laws regarding the invasion of marine alien species to ensure adequate control and management and minimise damage to China's marine environment. China should continue working with the IMO globally to develop sustainable technologies that will enhance BWM, even though China is a non-party to the BWM Convention. ***See more in Section 4(4.4) of the paper.***

- What is the legal implication of foreign vessels discharging ballast water in Nigeria?

As a sovereign nation, Nigeria signed and ratified the BWM Convention as early as October 2005 and had committed to continuing the implementation of the Convention, taking the lead in the West Africa sub-region, and working closely with its neighbouring countries to share experiences. Where the above happens, Nigeria will adopt the means of reporting to the flag state for such release of ballast water. If there is no response, other options can be availed, like taking legal action against such vessel or through diplomatic channels. This is emphasized by the International Tribunal for the Law of the Sea (ITLOS) in its Advisory opinion in Request for Advisory Opinion submitted by the Sub-Regional Fisheries Commission (SRFC), Advisory Opinion (Case No. 21), wherein it stated that concerned states "may hold liable the flag state of a vessel conducting such activities in their exclusive economic zones for a breach, attributable to the flag state, of its international obligations. ***See more in Section 4(4.5) of the paper.***

- What role do regional programmes play in BWM?

Article 197 of the UNCLOS urges states to cooperate on a global basis and, as necessary, on a regional basis, directly or through responsible international organizations, in formulating and elaborating international rules, standards and recommended practices and procedures for the protection and conservation of the marine environment, bearing in mind the characteristic regional features. Thus, such a regional programme can serve as a platform for monitoring and reporting mechanisms as envisaged under Article 6(1) of the BWM Convention. It will provide technical support to the national administrations, especially the port state administration, like the GloBallast Partnership, in developing economies for BWM. It can also serve as a modality for pooling resources for financing BWM technology research. ***See more in Section 4(4.6) of the paper.***

- Do you think the tripartite legal regimes on BWM are problematic?

Although the BWM Convention allows for unilateral stringent measures that must be in accord with international law for BWM, compliance with three sets of regulations is problematic. Though the IMO, EPA, and USCG regulations all enforce the same numeric discharge standards, substantial variation exists in the protocols required to meet these standards. Further to possible compliance complications, ship owners must also confront the substantial financial undertaking posed by installing multi-million-dollar ballast water management systems (BWMS), which could be rendered obsolete by evolving regulatory

programmes. This is because, given the cost and risk associated with installing a BWMS without a U.S. Coast Guard-type approval, vessel owners and operators must evaluate their options to maintain regulatory compliance. In my view, I think the differential legal regimes defeat the essence of international cooperation in tackling the global issue of BWM to reduce bio-invasion. It also imposes unnecessary costs on the stakeholders, notwithstanding the USCG's recognition of limited satisfactory technology for BWM, which informs why it made provision for AMS. ***See more in Section 5(5.1) of the paper.***

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[62] (n 61). See Nikolay Voutchkov, 'Considerations for Selection of Seawater Filtration Pretreatment System' (2010) 261 (3) *Desalination* 354–364, Dongxia Duan, Fengqi Xu, Tingyong Wang, Yu Guo, and Hongtian Fu, 'The Effect of Filtration and Electrolysis on Ballast Water Treatment' 268 *Ocean Engineering* 113301, Oscar Casas-Monroy (*et al.*), 'Evaluating Efficacy of Filtration+UV-C Radiation for Ballast Water Treatment at Different Temperatures' (2018) 133 *Journal of Sea Research* 20–28, Kairui Dong (*et al.*), 'A Study on Treatment Efficacy of Ballast Water Treatment System Applying Filtration + Membrane Separation + Deoxygenation Technology During Shipboard Testing' (2023) 188 *Marine Pollution Bulletin* 114620–114620, Richard J. Akers, 'Filtration Pretreatment' in Michael J. Matteson and Clyde Orr (eds), *Filtration: Principles and Practices* (2nd edn, Routledge 2017), and Matej David and Stephan Gollasch (eds), *Global Maritime Transport and Ballast Water Management: Issues and Solutions* (Springer 2015).

[63] Helmholtz Association of German Research Centres, 'Treating Ships' Ballast Water: Filtration Preferable to Disinfection' (2015) <https://m.phys.org/news/2015-07-ships-ballast-filtration-disinfection.html> (accessed on 28/01/2018).

[64] 'Ballast Water Filtration' <http://www.centrasep.com/ballast-water-filtration/> (accessed on 28/01/2018).

[65] 'Pre-treatment Filtration for Ballast Water' (2016) <http://www.filtsep.com/desalination/features/pre-treatment-filtration-for-ballast-water/> (accessed on 28/01/2018).

[66] (n 54).

[67] Jan Babicz, *Wartsila Encyclopedia of Ship Technology* (2nd edn, Wartsila Corporation 2015) 45.

[68] *Paragraph 1* of Regulation B-4 of Regulations for the Control and Management of Ships' Ballast Water and Sediment, Annexure to the BWM Convention, 2004

[69] *Paragraph 4(1)* of the G6- Guidelines for Ballast Water Exchange adopted in 2005 by Resolution MEPC. 124 (53).

[70] See *Regulation D-1* of Regulations for the Control and Management of Ships' Ballast Water and Sediment, Annexure to the BWM Convention, 2004.

[71] (n 67).

[72] Derek K. Gray, Thomas H. Johengen, David F. Reid, and Hugh J. MacIsaac, 'Efficacy of Open Ocean Ballast Water Exchange as a Means of Preventing Invertebrate Invasions Between Freshwater Ports' (2007) 52(6) *Limnology and Oceanography* 2386-2397.

[73] *Regulation B-4* of Regulations for the Control and Management of Ships' Ballast Water and Sediment, Annexure to the BWM Convention, 2004.

[74] *Paragraphs 1.7 and 4* of the G-8 Guidelines for Approval of Ballast Water Management System adopted in 2008 by Resolution MEPC. 174(58).

[75] Kyong M. Kim, 'A Study of the Implications of the Ballast Water Management Convention for the Flag States' (2013) *World Maritime University* 20.

[76] North, 'The Challenges' (2018) <http://www.nepia.com/insights/ballast-water-management/the-challenges/> (accessed 08/01/2018); Bellefontaine, N., Haag, F., Linden, O., & Matheickal, J. 'Emerging Ballast Water Management Systems' (2010) WMU-IMO, GloBallast Partnership.

[77] *Regulation B-1* of Regulations for the Control and Management of Ships' Ballast Water and Sediment, Annexure to the BWM Convention, 2004.

[78] (n 77).

[79] NorthStandard, 'Ballast Water Convention – Postponement for Existing Vessels' <https://www.nepia.com/industry-news/ballast-water-convention-%C2%96-postponement-for-existing-vessels/> (accessed on 15/01/2024).

[80] IMO, 'Ballast Water Management' <https://www.imo.org/en/ourwork/environment/pages/ballastwatermanagement.aspx> (accessed on 15/01/2024).

[81] Howard S. Schiffman, 'International Law and the Protection of the Marine Environment' in Aaron

Schwabach and Arthur John Cockfield (eds), *International Law and Institutions* (Volume 1, EOLSS Publications 2009) 213.

[82] IMO, 'What It is' <www.imo.org> (accessed on 31/01/2018).

[83] Structure of IMO <http://www.imo.org/en/About/Pages/Structure.aspx#4> (accessed on 31/01/2018).

[84] Marine Environment Protection Committee (MEPC), http://www.imo.org/en/MediaCentre/MeetingSummaries/MEPC/Pages/Default.aspx (accessed on 31/01/2018).

[85] *International Guidelines for Preventing the Introduction of Unwanted Aquatic Organisms and Pathogens from Ships' Ballast Water and Sediment Discharges, Resolution*, MEPC.50(31), adopted on 4 July 1991.

[86] *Article 192* of UNCLOS provides that States should protect and preserve the marine environment.

[87] Philippe Sands (*et al.), Principles of International Environmental Law* (4th edn, Cambridge University Press 2018) 462.

[88] See generally *Articles 21(1) (f), 42 (1) (b) and 54* of UNCLOS.

[89] *Article 56(1) (b) (iii)* of UNCLOS stipulates among other things that; "in the exclusive economic zone, the coastal State has authority as provided for in the relevant provisions of this Convention concerning the protection and conservation of the marine environment.

[90] *Article 193* of UNCLOS. See also *Principle 21 of the Declaration of United Nations Conference on the Human Environment,* 1972; which equally obliged that "states have, in line with the Charter of the United Nations Organization and the postulates of international law, the sovereign right to utilize their resources compatible with their environmental policies, and the responsibility to assure that activities within their jurisdiction or control do not create harm to the environment of another State or areas beyond the limits of national jurisdiction" and in this context refers to marine environment beyond state control.

[91] David Attard, Malgosia Fitzmaurice, and Norman A. Martinez Gutierrez, (eds), *The IMLI Manual on International Maritime Law Volume I: The Law of the Sea,* (Oxford University Press 2014) 594.

[92] See *Article 195 of the UNCLOS* which obliged states not to transfer one type of pollution to another and it states that: "In taking actions to prevent, reduce and control pollution of the marine environment, States shall behave so as not to transfer, directly or indirectly, harm or hazards from one area to another or convert one type of pollution into another." *Article 196 of the UNCLOS* further stipulates that "States shall take all measures necessary to prevent, reduce and control pollution of the aquatic environment emanating from the use of technologies under their jurisdiction or control, or the deliberate or accidental introduction of species, alien or new, to a distinct part of the marine environment, which may create significant and harmful changes thereto and this does not affect the purpose of this Convention regarding the prevention, reduction and control of pollution of the marine environment."

[93] (n 87) 464.

[94] (n 91) 595.

[95] (n 87) 464.

[96] See *Article 237 of the UNCLOS* which noted that "The provisions of this Part on protection and preservation of the marine environment are without prejudice to the specific obligations assumed by States under special conventions and agreements concluded previously which relate to the protection and preservation of the marine environment and to agreements which may be concluded in furtherance of the general principles set forth in this Convention and specific obligations assumed by States under special conventions, with respect to the protection and preservation of the marine environment, should be carried out in a manner consistent with the general principles and objectives of this Convention."

[97] *Article 2(1)* of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, BWM/CONF/36, 16 February 2004 (BWM Convention).

[98] *Article 2(3)* of the BWM Convention, 2004.

[99] *Article 2(4)* of the BWM Convention, 2004.

[100] Thalatha Sreeni Ranasinghe, 'Review of the Capacity of the Implementation of Ballast Water Management Convention in Sri Lanka as Flag State, Port State and Coastal State'(2016) *World Maritime University Dissertations*, 35.

[101] *Paragraph 19.1* of the Report of the Marine Environment Protection Committee at its 71st Session, MEPC 71/17/Add.2, adopted on 31 July 2017.

[102] Guidelines for Sediment Reception Facilities (G1), Resolution MEPC.152(55), adopted on 13 October 2006.

[103] *Article 5(2)* of the BWM Convention, 2004.

[104] *Paragraph 1.1* of Guidelines for Sediment Reception Facilities (G1), Resolution MEPC.152(55), adopted on 13 October 2006.

[105] *Article 9 (1)* of BWM Convention, 2004.

[106] See *Article 9(2)* of BWM Convention, 2004.

[107] See generally *Articles 8, 10-12* of BWM Convention, 2004.

[108] *Paragraph 19.3* of the MEPC 71 Report, 2017

[109] G15-Guidelines for Port State Control under the BWM Convention, Resolution MEPC. 252 (67), adopted on October 17, 2014.

[110] 'Sampling and Analysis of Ballast Water in the Context of PSC' <https://www.safety4sea.com/sampling-and-analysis-of-ballast-water-in-the-context-of-psc/> (accessed on 12/02/2018).

[111] (n 109) *Paragraph 2.1* of the G15-Guidelines for Port State Control under the BWM Convention. See *Paragraph 19.4* of the MEPC 71 Report, 2017. Cf. IMO Resolution A. 1052 (27) on Procedures for Port State Control, 2011.

[112] *Paragraph 19.5* of the MEPC 71 Report, 2017.

[113] *Paragraph 6.3* of G2-Guidelines for Sampling of Ballast Water Resolution MEPC.173(58), adopted

on 10 October 2008.

[114] (n 110).

[115] *Paragraph 5.2* of G2-Guidelines for Sampling of Ballast Water, 2008.

[116] *Paragraph 1.4* of G2-Guidelines for Sampling of Ballast Water, 2008.

[117] (n 110).

[118] (n 110).

[119] Myres S. McDougal, William T. Burke, and Ivan A. Vlasic, 'The Maintenance of Public Order at Sea and the Nationality of Ships' (1960) 54 *American Journal of International Law* 25–116, David Attard, Malgosia Fitzmaurice, Norman Martinez, and Riyaz Hamza (eds), *The IMLI Manual on International Maritime Law Volume III: Marine Environmental Law and Maritime Security Law,* (Oxford University Press, 2016).

[120] See *Articles 1, 4 and 6* of MARPOL Convention 1973/1978.

[121] *Article 217* of the UNCLOS is quite explicit on the enforcement obligations of the flag state.

[122] Tamo Zwinge, 'Duties of Flag States to Implement and Enforce International Standards and Regulations and Measures to Counter their Failure to Do So' (2011) 10 (2) *Journal of International Business and Law* 301-305.

[123] Malcolm N. Shaw, *International Law* (7th ed., Cambridge University Press, 2014), David Attard, Malgosia Fitzmaurice, Ignacio Arroyo, Norman Martinez, and Elda Belja, (eds), *The IMLI Manual on International Maritime Law Volume II: Shipping Law* (Oxford University Press 2016), David Attard, Malgosia Fitzmaurice, and Norman A. Martinez Gutierrez, (eds), *The IMLI Manual on International Maritime Law Volume I: The Law of the Sea* (Oxford University Press 2014), B. A. Boczek, *Flags of Convenience: An International Legal Study* (Harvard University Press 1962), H. Meyers, *The Nationality of Ships* (Nijhoff Den Haag 1967); Nagendra Singh, *Maritime Flag and International Law* (Sijthoff 1978).

[124] See James Crawford, *Brownlie's Principles of Public International Law* (8th edn, Oxford University Press 2012) and Christine Chinkin and Freya Baetens (eds.), *Sovereignty, Statehood and State Responsibility* , (Cambridge University Press 2015).

[125] (n 42) 31.

[126] See *Article 5* of the 1958 High Seas Convention and *Article 91(1)* of the UN Convention on the Law of the Sea of 1982

[127] See *Article 91(1)* of the UNCLOS which stipulates among other things that "… There is a requirement for the existence of a "genuine link" between the State and the ship." See also the International Tribunal for the Law of the Sea (ITLOS) deliberation on the genuine link concept in the cases of *the SAIGA (No 2) Case ([Saint Vincent and the Grenadines v Guinea] [Merits] ITLOS Case No 2 [1 July 1999]; 'Saiga Case')* and *the Grand Prince Case ([Belize v France] [Prompt Release] [Judgment] ITLOS Case No 8 [20 April 2001])* ; wherein, in the Saiga Case, Guinea contended that Saint Vincent and the Grenadines had no locus standi because there was no genuine link between the M/V Saiga and the claimant, and that Guinea was, therefore, not bound to recognize the Vincentian nationality of the ship (Saiga Cases) and ITLOS interpreted the genuine link requirement in Art. 91 (1) UNCLOS in the light of Arts 92 and 94 UN Convention on the Law

of the Sea and concluded that the object of the provisions of the Convention on the necessity for a genuine link connecting a ship and its flag State is to ensure an effective implementation of the obligations of the flag State, and not to set criteria by reference to which the legality of the registration of ships in a flag State may be challenged by other States. (Saiga Case para. 83).

[128] Ahmed Hany M. Abuelenin, 'Legal Framework of Port State Control and Flag State Implementation regarding the Safe Management of Ballast Water' (2015) 3 *International Journal of Multidisciplinary and Current Research* 1147.

[129] See *Article 2(3)* of the BWM Convention. *Paragraph 8* of the Article further mandates that "parties shall encourage ships entitled to fly their flag, and to which this Convention applies, to avoid, as far as practicable, the uptake of Ballast Water with potentially Harmful Aquatic Organisms and Pathogens, as well as Sediments that may contain such organisms, including promoting the adequate implementation of recommendations developed by the Organization".

[130] See also *Article 2(3)* of the BWM Convention which requires any stringent measures taken by any state party to be consistent with international law, but it seems non-parties might take measures at variance with existing international but in compliance with its national laws like the USCG Rules.

[131] *Article 4(1)* of the BWM Convention.

[132] *Article 4(2)* of the BWM Convention.

[133] *Article 8(3)* of the BWM Convention.

[134] *Regulation B-2* of the Annex to the BWM Convention.

[135] *Regulation B-1* of the Annex to the BWM Convention.

[136] *Article 7(1)* of the BWM Convention; See also *Regulation E-1* of the Annex to the BWM Convention.

[137] (n 39) 67-69.

[138] Henrik Ringbom, *Jurisdiction Over Ships: Post-UNCLOS Developments in the Law of the Sea,* (BRILL, 2015).

[139] C. C. A. Voskuil, Z. Parac, and J. A. Wade (eds.), *Hague-Zagreb Essays 6 on the Law of International Trade*, (Martinus Nijhoff Publishers, 1987) 330.

[140] *Article 227* of the UNCLOS; See also *Article 2(4)* of the Memorandum of Understanding on Port State Control, Paris, 1982 which similarly noted that "in applying a relevant instrument for PSC, the Authorities will ensure that no more favourable treatment or protection is given to vessels flying the flag of a state which is a non-party to that instrument".

[141] Sabitiyu Abosede Lawal, 'Ballast Water Management Convention, 2004: Towards Combating Unintentional Transfer of Harmful Aquatic Organisms and Pathogens' (2011) *Dalhousie University Halifax* 115.

[142] Kitack Lim, 'The Role of the International Maritime Organization in Preventing the Pollution of the World's Oceans from Ships and Shipping' (2017) Volume LIV Nos. 1 & 2, <https://unchronicle.un.org/article/role-international-maritime-organization-preventing-pollution-worlds-oceans-ships-and> (accessed on 15/02/2018).

[143] Daniela Addis, 'The Protection and Preservation of the Marine Environment, International Court of Environment Foundation (ICEF)' (2021) 138 *Al-Adab Journal*.

[144] Md. S. Karim, *Prevention of Pollution of the Marine Environment from Vessels*, (Springer 2015) 15.

[145] *Article 13* of the BWM Convention, 2004.

[146] *Article 14* of the BWM Convention, 2004; See also *Regulation C-3* of the Annex to the BWM Convention, 2004.

[147] See *Regulation B-1* of the Annex to the BWM Convention, 2004.

[148] *Regulation D-5* of the Annex to the BWM Convention, 2004.

[149] See *Regulations D-3 and D-4* of the Annex to the BWM Convention, 2004.

[150] See *Article 3(3)* of the BWM Convention which only applies to the ships of non-parties to the Convention.

[151] The GEF-UNDP-IMO GloBallast Partnerships Programme is supporting developing countries to lessen the transfer of harmful aquatic organisms and pathogens in ships' ballast water and fulfil the IMO Ballast Water Management (BWM) Convention. The GloBallast Project is a notable example of direct, large-scale action taken by IMO together with other international entities, to address a global threat to the health of the world's oceans, by further improving the environmental and socio-economic sustainability of shipping and reducing its negative impact on the marine ecosystems. Since 2000 and driven by the urge to mitigate the impacts of harmful aquatic invasions, the United Nations Development Program (UNDP), the Global Environment Facility (GEF), and the IMO have worked together under the GloBallast Partnerships Project to foster an unprecedented international and public-private cooperation in the area of ballast water management. <http://archive.iwlearn.net/globallast.imo.org/> (accessed on 03/03/2018).

[152] Seafarers' Rights International, 'Flag State Responsibilities and Seafarers' Rights' < http://seafarersrights.org/flag-state-responsibilities-and-seafarersrights/> (accessed on 17/02/2018).

[153] (n 152).

[154] (n 152).

[155] (n 152).

[156] International Law Commission, *Draft Articles on Responsibility of States for Internationally Wrongful Acts*, November 2001, Supplement No. 10 (A/56/10), chp.IV.E.1.(Annex to the Resolution adopted by the General Assembly, at its 56th Session on 28 January 2002).

[157] See *Articles 2 and 3* of the Articles on States Responsibility for Internationally Wrongful Acts (ARSIWA).

[158] Peter T. Jenkins, 'Paying for Protection from Invasive Species' (2002) 19 (1) *Issues in Science and*

Technology 67-72.

[159] Sompong Sucharitkul, 'Liability and Responsibility of the State of Registration or the Flag State in Respect of Sea-Going Vessels, Aircraft and Spacecraft Registered by National Registration Authorities' (2006) 54 *American Journal of Comparative Law* 409, 415.

[160] (n 159).

[161] An International Fund was set up, contributed by States Members to abate the consequences of oil pollution at sea caused by tankers. See the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (1992 Fund), and the International Oil Pollution Compensation Supplementary Fund 2003 (Supplementary Fund) entered into force on 3 March 2005.

[162] (n 159) 418.

[163] *Article 8(1)* of the BWM Convention, 2004.

[164] (n 163).

[165] *Article 8(3)* of the BWM Convention, 2004.

[166] *Factory at Chorzów case (Germany v. Poland), Jurisdiction*, 1927, PCIJ, Series A, No.9, p. 21.

[167] *Factory at Chorzów case (Germany v. Poland), Merits*, 1928 PCIJ, Series A, No. 17, p. 47.

[168] See *Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica v. Nicaragua)*, Compensation, Judgment, I.C.J. Reports 2018, p. 15, and the Separate Opinion of Judge Cançado Trindade, p. 61.

[169] *Request for Advisory Opinion submitted by the Sub-Regional Fisheries Commission (SRFC), Advisory Opinion,* 2 April 2015, ITLOS Reports 2015, paragraphs 141-147. (Emphasis added). See Dan Sarooshi, 'Investment Treaty Arbitration and the World Trade Organization: What Role for Systemic Values in the Resolution of International Economic Disputes?' (2014) 49 (3) *Texas International Law Journal* 445.

[170] See *Article 94(1)* of UNCLOS, 1982; See also (n 39) 230. Cf. *Article 11* of the BWM Convention, 2004.

[171] *Article 16* of the BWM Convention, 2004.

[172] Nivedita M. Hosanee, 'A Critical Analysis of Flag State Duties as Laid Down Under Article 94 of the 1982 United Nations Convention on the Law of the Sea' (2009) Division for Ocean Affairs and the Law of the Sea Office of Legal Affairs, United Nations, New York 71-78.

[173] Tim Stephens, 'ITLOS Advisory Opinion: Coastal and Flag State Duties to Ensure Sustainable Fisheries Management' (2015) 19 (8) *American Society of International Law* <https://www.asil.org/insights/volume/19/issue/8/itlos-advisory-opinion-coastal-and-flag-state-duties-ensure#_edn37> (accessed on 18/02/2018).

[174] *Request for Advisory Opinion Submitted by the Sub-Regional Fisheries Commission (SRFC), Advisory Opinion,* 2 April 2015, ITLOS Reports 2015, paragraphs 147.

[175] Andrew N. Cohen (*et al.*), 'Revisiting the Basis for US Ballast Water Regulations' (2017) 118 *Marine Pollution Bulletin* 348.

[176] 'IMO vs USCG: Navigating the Differences in Ballast Water Regulation' <http://www.ship-technology.com/features/featureimo-vs-uscg-navigating-the-differences-in-ballast-water-regulation-4824245/> (accessed 09/01/2018).

[177] This Act, *Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990* — Title I of P.L. 101-646 (104 Stat. 4761, 16 U.S.C. 4701, enacted November 29, 1990) established a broad new Federal program to prevent introduction of and to control the spread of introduced aquatic nuisance species and the brown tree snake. The U.S. Fish and Wildlife Service, *the U.S. Coast Guard*, the Environmental Protection Agency, the Army Corps of Engineers, and the National Oceanic and Atmospheric Administration all were assigned, major, new responsibilities, including membership on an Aquatic Nuisance Species Task Force established to develop a program of prevention, monitoring, control, and study, https://www.fws.gov/laws/lawsdigest/nonindi.html (accessed on 26/02/2018).

[178] The *National Invasive Species Act* (NISA) is a United States national law intended to prevent invasive species from entering inland waters through ballast water carried by ships. NISA reauthorised and amended a previous measure, the Non-Indigenous Aquatic Nuisance Prevention and Control Act of 1990 (NANPCA).

[179] Such modalities include using thus: a US type approved BWM system to meet the standard; temporary use of a foreign type-approved BWMS that has been accepted by the Coast Guard as ***an alternate management system (AMS)*** (5-year limitation) if installed in compliance with *33 CFR Part 151;* use and discharge ballast water obtained exclusively from a U.S. public water system; discharge of ballast water to a reception facility, and no discharge of unmanaged ballast water inside 12 nautical miles of the US waters. See *Part 151, Subpart D (Ballast Water Management for Control of Nonindigenous Species in Waters of the United States) of the Electronic Code of Federal Regulation*– <https://www.ecfr.gov/cgi-bin/text-idx?SID=5b135cf7376801319d4082c4227298ba&mc=true&node=pt33.2.151&rgn=div5#se33.2.151_12025> (accessed on 09/01/2018).

[180] World Shipping Council, 'U.S. Approval for Ballast Water Treatment Technology' <http://www.worldshipping.org/industry-issues/environment/vessel-discharges/u-s-approval-for-ballast-water-treatment-technology> (accessed on 19/02/2018).

[181] (n 180).

[182] (n 180).

[183] See *Part 151, Subpart D (Ballast Water Management for Control of Nonindigenous Species in Waters of the United States) of the Electronic Code of Federal Regulation*– <https://www.ecfr.gov/cgi-bin/text-idx?SID=5b135cf7376801319d4082c4227298ba&mc=true&node=pt33.2.151&rgn=div5#se33.2.151_12025> (accessed on 09/01/2018).

[184] (n 183).

[185] 'International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 and US Ballast Water Management (BWM) Regulations' <http://www.nepia.com/news/circulars/international-convention-for-the-control-and-management-of-ships%E2%80%99-ballast-water-and-sediments-2004-and-us-ballast-water-management-(bwm)-regulations/> (accessed on 09/01/2018).

[186] For the most recent approvals, see U.S. Coast Guard Marine Safety Center, 'Ballast Water Management Type Approval Information' <https://www.dco.uscg.mil/Our-Organization/Assistant-Commandant-for-Prevention-Policy-CG-5P/Commercial-Regulations-standards-CG-5PS/Marine-Safety-Center-MSC/Ballast-Water/> (accessed on 14/01/2024).

[187] (n 185).

[188] (n 185).

[189] U.S. Environmental Protection Agency, 'Vessels-VGP' <https://www.epa.gov/vessels-marinas-and-ports/vessels-vgp> (accessed on 14/01/2024). See 'Vessel Discharges: Ballast Water' <http://www.worldshipping.org/industry-issues/environment/vessel-discharges/ballast-water> (accessed on 20/02/2018).

[190] U.S. Environmental Protection Agency, 'NPDES – Vessel General Permit for Discharges Incidental to the Normal Operation of Vessels (VGP)' <https://www.regulations.gov/docket/EPA-HQ-OW-2008-0055> (accessed on 14/01/2024).

[191] 'National Pollutant Discharge Elimination System (NPDES)' <https://www.epa.gov/npdes/vessels-vgp> (accessed on 09/01/2018).

[192] (n 189).

[193] (n 189).

[194] (n 190).

[195] (n 189).

[196] California State Land Commission, 'California Adopts Federal Ballast Water Discharge Standards' <https://www.slc.ca.gov/marine-invasive-species-program/ca-adopts-federal-ballast-water-discharge-standards/> (accessed on 14/01/2024).

[197] See Part 31, Water Resources Protection of the Natural Resources Environmental Protection Act, PA 451 of 1994, as amended. (MCL 324.3109)

[198] "Ballast Water & Port Operations Permit", http://www.michigan.gov/statelicensesearch/0,4671,7-180-24786-245083–,00.html (accessed on 20/02/2018)

[199] *State of Michigan Department of Environmental Quality* Ballast Water Control General Permit Port Operations and Ballast Water Discharge, Permit No. M0G140000, available at http://www.michigan.gov/documents/deq/wrd-ballast-GP-M0G140000-2017_550366_7.pdf (accessed on 20/02/2018)

[200] State of Michigan Department Of Environment, Great Lakes, And Energy, 'Ballast Water Control

General Permit Port Operations And Ballast Water Discharges: Permit No. M0G140000' <https://www.michigan.gov/egle/-/media/Project/Websites/egle/Documents/Programs/WRD/Ballast-Water/GP-M0G140000-2022.pdf?rev=41936cfe606442b2b828e45e3b0b40b4&hash=086E6C1A21543AB2F2950E514851DAB3> (accessed on 14/01/2024).

[201] (n 200) Paragraph 15 of Section C of Part II.

[202] Aibin Zhan, Ping Ni, Wei Xiong, Yiyong Chen, Yaping Lin, Xuena Huang, Yuzhan Yang, and Yangchun Gao, 'Biological Invasions in Aquatic Ecosystems in China' in Fanghao Wan, Mingxing Jiang, Aibin_Zhan (eds.), *Biological Invasions and Its Management in China (*Volume 1, Springer 2017) 88.

[203] (n 202).

[204] Huixian Wu (*et al*.), 'The Biological Content of Ballast Water in China: A Review' (2017) 2 (6) *Aquaculture and Fisheries* 241.

[205] (n 204).

[206] (n 204).

[207] State Oceanic Administration, www.english.gov.cn/state_council/2014/10/06/content_281474992889983.htm (accessed on 09/01/2018).

[208] (n 37) 176.

[209] (n 37) 176-178.

[210] GloBallast Partnerships http://archive.iwlearn.net/old.globallast.imo.org/index8c36.html?page=announcements.asp (accessed on 20/02/2018)

[211] *Nigerian Maritime Administration and Safety Agency (NIMASA) Act* CAP N161 LFN, 2007.

[212] (n 211) See *Section 22*.

[213] *Merchant Shipping (Ballast Water Management) Regulation*, 2012, B 3334

[214] *Merchant Shipping Act*, 2007, provides for regulation of merchant shipping, and for related matters in Nigeria

[215] See *Regulation 10*, Merchant Shipping (Ballast Water Management) Regulation, 2012, B 3334.

[216] (n 213) *Regulation 12*.

[217] *Ballast Water Sediment (Reception Facilities) Regulations*, 2010.

[218] (n 217) See *Regulation 2*.

[219] Babajide I. Alo, 'National Ballast Water Management Strategy for Nigeria' (2011) Submitted to Nigerian Maritime Administration and Safety Agency, 28.

[220] J. Tamelander, L. Riddering, F. Haag and J. Matheickal, 'Guidelines for Development of a National

Ballast Water Management Strategy' GloBallast Monograph Series No. 18.

[221] (n 219).

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