

Research Article

Evaluation of Preparedness Level of Sri Lanka to Join the International Ballast Water Management Convention

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Abstract

The release of unmanaged ships' ballast water (BW) affects marine ecosystems, humans, and their activities. The International Maritime Organization (IMO) adopted the Ballast Water Management Convention (BWMC) to prevent and eliminate this risk.

In this study, classification of the main requirements of the BWMC was done by Flag State (FS), Port States (PS) and Coastal States (CS). Five basic requirements under FS are identified as; 1. Guidance, national strategy, and legislations, 2. Survey, certification and recognized organizations, 3. Approval for BWM Systems, 4. Training of crew members and transfer of knowledge and 5. Violation Detections, Sanction and Investigation. Five basic requirements PS were identified as; 1. Protecting port areas and socio-economic activities, 2. Compliance monitoring & enforcement, 3. Training of Port State Control officers, 4. Regional and international cooperation and 5. Sediment reception facilities. Also, five basic requirements identified as CS are; 1. Environment monitoring & scientific research, 2. Contingency plans, preparedness, awareness and additional measures, 3. Risk assessments, exemptions, and determination of designated areas, 4. Detection and investigation of violations & notification and 5. Regional and international cooperation.

Sri Lanka is exposed and vulnerable to Invasive Alien Species (IAS). Inclusive study of the risks of IAS was carried out and information collected regarding the exposure and the preparedness of the ratification of BWM in Sri Lanka as FS, PS, and CS. Critically analyze the current position of the country in relation to ballast water and sediment management practices. Currently BWM practices are not being used and regulations are not implemented with regard to the convention. Financial, legal and institutional capacities are identified as the main challenges of the implementation process of the BWM Convention in Sri Lanka. Above identified requirements are establishment of laboratory facilities, train personnel on scientific analysis onboard and ashore and implementation & enforce laws and regulations as per the guidelines of the BWMC.

Keywords: *Ballast Water Management, Invasive Alien Species, Harmful Aquatic Organisms and Pathogens, Risks Assessments*

Introduction

Oceans and other water bodies are strongly connected with human activities since the Stone Age [1,2]. Hazardous for human beings and long considered to overwhelmed mankind abilities, seas are now seriously affected by human activities on shore and at sea [3-5].

The impact of sea activities (fishing, transportation, offshore exploitation and military) dramatically increased within the last decades [6-8]. In this respect, the increase of seaborne trade during the 'second stage of globalization' [9] exceeds for the first time 10 billion tons in 2015 carried by cargo ships of all kinds [8]. Unable to operate without ballast water (BW) to distribute weights on board ships, present shipping fleet constitutes a major threat of translocation of species beyond their natural habitat through ballast water and hull fouling.

Considered one of the main risks for seas by natural scientists [5], invasive species proliferate in marine environment particularly in relation with the release of large amount of Ballast water and sediments by ships [10].

Under specific conditions [11], the introduced alien species may become Invasive Alien Species (IAS). IAS are identified as one of the major causes to the environment such as biodiversity loss, changes in ecosystem functions and ecosystem services. It causes a threat for industrial and several socio-economic activities as well [12].

The problem of harmful aquatic organisms (HAOP) in Ballast Water was first raised at the International Maritime Organization (IMO) in 1988. After adopting guidelines in 1997 by Resolution A868 (20), the IMO adopted the International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWMC) in 2004. Reaching its entry into force criteria in September 2016 by cumulating 52 countries and more than 35% of the world's merchant shipping gross tonnage [13], the Convention will enter into force on 08 September 2017.

"To prevent, minimize and ultimately eliminate the transfer of" HAOP (art.2 of BWMC), the Convention imposes standards for the management of BW. As numerous countries and in order to participate in the protection of its marine ecosystems, the implementation of the Convention in Sri Lanka requires studies and an evaluation of the current status of the capacity of the country to reach the requirements of the Convention. The present study summarizes the situation of Sri Lanka in relationship with the requirements of the BWMC.

The architecture of the study follows four axes: (1) presentation

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of the BWMC requirements through a Flag, Coastal and Port State classification (2) evaluation of the preparedness for implementation of Ballast Water Management Convention; (3) review of the ability to fulfill BWMC requirements as Flag State, Port State, and Coastal State; and (4) discuss the major challenges and barriers met in Sri Lanka to the implementation of the BWM Convention.

Research materials and methods

A number of prevailing documents and sources about IAS and BWMC were examined and placed in context of Sri Lanka.

The evaluation of Sri Lankan situation was study through distance and onsite investigations. Numerous representatives from National administrations and research bodies were contacted. In short, interviews and use of national resources were mobilized to collect data on the present situation.

Results

Classification of the main requirements of the BWM Convention

The main requirements of the BWMC have been classified in three categories of obligations in relation as proposed by the matrix developed by the IMO in the III Code - The IMO Instruments Implementation (III) Code - Resolution A.1070 (28). Indeed, to comply with the variety of their obligations, States have to demonstrate their ability to fulfil their obligations as Flag State, Port State, and Coastal State.

Flag State definition and basic requirements

The flag State is the State which provide its nationality to ships recorded in its registers [14]. In short, the flag State imposes its regulatory framework on the ships holding its nationality. However, under international law, the flag has responsibilities. The 1982 United Nations Convention on the Law of the Sea (UNCLOS) highlights flag State obligations particularly in its article 94 which recalls that flag States shall ensure that ships flying their flag are in compliance with the requirements of the international rules. Acting as ships, crew and onboard equipment regulators, flag States play strategic roles in ensuring compliance on its vessels. Flag States must understand their general and specific obligations (and particularly towards BWMC) as well as develop a compliance monitoring and enforcement system.

Under the BWMC, five key areas have been identified for the flag State to comply with.

Guidance, national Strategy and legislations

According to Part 2 of the IMO Instruments Implementation Code (III Code paragraph 15 and 16), Flag States are responsible to develop and administer safety and environmental protection programs. Such programs guide the administrative action and contain administrative instructions to support the implement of international regulations. In this respect, flag State provides guidance to maritime stakeholders, including inspectors, ship owners and crew to facilitate compliance with regulations. Specific to each Convention, instructions and programs to support the BWMC have to be prepared and spread among the fleet.

Indeed, the formulation of National Ballast Water Management Strategy (NBWMS) and appropriate legislation are essential to conduct and monitor flag State actions [12].

Survey and Certification and Recognized Organizations

Each party has the duty to supervise ships with regard to the BWM compliance [15]. According to Article 2 and Article 7 of the BWM Convention, States are obliged to give “[...] *full and complete effect to the provisions* [...]” and “[...] *ships flying its flag or operating*

under its authority and subject to survey and certification [...]”.

The supervision is organized through survey and certification of ships by flag State inspectors or/and Recognized Organizations (ROs) acting on flag States’ behalf. The flag remains responsible for the certificates issued on its name and therefore must supervise ROs activities (III Code paragraphs 18 to 21). Moreover, article 4.2 of the BWM convention requires Parties to apply the relevant standards and take effective measures to comply with those requirements.

Article 7 and related section E of the BWMC detail the requirements for surveying and certifying ships. To issue the International Ballast Water Management Certificate (IBWMC), flag State or Recognized Organizations (ROs) inspectors have to verify ship’s, crew and documentary compliance. In this respect, the verification of the BWM Plan and type-approved BWM systems certification (if the ship has to comply with D-2 Standard) are vital.

Approval for BWMS Systems

For ships managing their BW according to D-2 Standard, the on-board equipment must be type-approved. Flag States are responsible to develop measures and procedures in order to approve or/and recognize BWMS. The approval process consists of shore-based and on-board testing procedures (G8 and G9).

Training of crew members and transfer of knowledge

The Convention requires officers and crew to be trained and familiarized in order to implement the BWM Plan and operate safely the BWM equipment onboard. In addition, the flag State inspectors or the ROs’ surveyors must be appropriately qualified (III Code paragraph 29 to 36). Moreover, under article 6, Parties are encouraged to promote scientific cooperation and technology assistance.

Violation detection, sanction and investigation

Article 8 of the Convention indicates that any violations of the requirements of the convention shall be prohibited and sanctions shall be established according to the law of the Flag States. The flag State shall inform regarding the alleged violation to the relevant country and the IMO as well. If the administration of the Flag State has sufficient evidences on violations, the immediate legal proceeding has to be taken accordingly [16]. Moreover, as general obligation, in case of incident or accident related with BWM equipment or operations entering in the scope of the IMO Casualty Investigation Code (MSC 255(84); MSC-MEPC.3/Circ.2) and III Code (paragraph 40 and 41), proper investigations by qualified inspectors must be conducted.

Port State Requirements

The Port State (PS) can be defined as the State which has the authority to inspect the foreign vessels that voluntarily enter into their national ports by confirming the condition of the vessel and the equipment. These inspections are focused on to verify the circumstances of the vessels, its operations, manning and its equipment that complies with the requirements of international rules and regulations. Port States also provides a framework to safeguard and protect port areas.

Five identified technical social requirements in the BWM Convention that obliged to the Port State:

Protecting port areas and socio-economic activities

Risk assessment and scientific research are obliged to Port States and/or Coastal States to protect the port areas. Article 6 of the Convention gives the provision to the Port States to carry out scientific researches, facilitate research and monitor the effects of ballast water management under their jurisdiction [16].

Compliance monitoring and enforcement

Under Article 9, of the Convention it is stated that Port State Control

Officers (PSCO) are duly authorized of inspect of ships who can verify whether the ship has a valid certificate. PSCO shall inspect the Ballast Water Record Book, or sampling of the ship's ballast water carried out in accordance with the guidelines of the convention. Also, PSC has to ensure that the ship's international BWM certificate and the Type Approval Certificate carried out accordance with the BWM Convention.

Training of Port State Control Officers (PSCO)

According to the regulation B-5 of the Convention, the Port States are obliged to provide adequate training for their inspectors in several aspects of the Convention. The officials shall be familiar with the implementation of the BWM Plan and the safe operations of the BWT system onboard and sample analyses [16].

Regional and International Cooperation

Port States are coordinate with the IMO and shall coordinate with other parties on any requirements and procedures relating to ballast water management including laws, regulations, guidelines and the availability of the reception facilities when necessary [16].

According to Article 13, parties are responsible for coordinating with international bodies to train personnel and ensuring the availability of technologies & facilities. Carrying out joint research programs for the effective management of BW and sediment are included for better management of the BW issue [16].

Sediments Reception Facilities

As per the Article 5 of the Convention, ports, and terminals of the member states shall provide adequate sediment reception facilities where, cleaning and repair of ballast tanks taking place. These reception facilities must be in accordance with the G1-guidelines to provide safe disposal of ballast sediments.

Coastal State Requirements

The Coastal State can be defined as the State who is responsible for the protection of their national waters (including marine resources), from any activity that may cause damage or threat. The Coastal States has the power to regulate the right and duties and also the navigating of ships in different sea areas. The legislative power should not impair the rights of innocent passage of foreign ships unless those ships violate the international standards rules and regulations causing damage their marine environment [17].

Five identified technical social requirements in the BWM Convention that obliged to the Coastal State:

Environmental monitoring and scientific research

Coastal State is obliged to make the necessary arrangements to control and prevent the risks arising from the BW impacts on the coastal and maritime areas in their territory. Accordingly, article 6.1 gives provision to promote and facilitate scientific research and monitor waters under their jurisdiction on the impacts of HAOP introduced from ballast water sediments. Observations, measurements, sample analyses and evaluations are to be included in such research. Port Biological Baseline Survey (PBBS) is one of the main processes included in the research sector that provides the baseline information [18].

Contingency Plans, Preparedness, Awareness and additional measures

Contingency plans must be ready to implement in case of emergency and mechanism to seek support from neighboring countries. Parties shall warn mariners on the alternative areas suitable for the uptake of ballast water. Also, parties are obliged to notify mariners by precise and accurate coordinates for areas where ships

should not uptake sea water due to identified reasons [16].

Regulation C.1 of the Convention states that States shall take the necessary additional measures when required to eliminate the HAOP. These additional measures are required in certain areas in addition to the D-1 and D-2 management measures in the convention.

Risk assessment, Exemptions and determination of designation areas

The G7 guidelines of the Convention indicated that any exemptions from BWM methods for ships shall granted if there are no negatively impacts on the environment, human health, property or resources [10]. For this purpose, 3 risk assessment methods to carry out and Party should provide all the relevant information to the ship owner to follow the RA guideline [10]. These risks assessments could be useful when decision making for the designated areas where BW exchanges could be allowed [19].

Detection and investigation of violations and notification

As per the Article 10 of the Convention, Parties shall cooperate in the detection of violations and the enforcement of the regulations given in the Convention. When a request for an investigation received from any State together with sufficient evidence, States may have the authority to inspect the ship when it enters their port or terminals under its jurisdiction [16].

Regional and international cooperation

Article 13.3 of BWMC provides provisions to States to enhance regional cooperation by regional agreements. The sharing of scientific knowledge concerning BWM, training personnel, initiating joint research and development programs, and sharing the relevant technology & facilities are expected activities through regional and international cooperation [16]. Table 1.

Vulnerability of Sri Lanka

Sri Lanka is an island country that has a great maritime heritage and is located in a significant geographical point in the Indian Ocean. Because of this unique situation, it creates trans-shipment activities and trade to the country [20].

There are 5 ports existing in Sri Lankan coast, but port of Colombo is the major port that heavily connected with the international shipping community. Because of this reason, there are identified risks related on the environment.

Table 1: Summary of the State requirements.

Requirement	Flag state	Port State	Coastal State
1	Protection and Guidance for the National fleet	Protecting port areas and socio-economic activities	Environmental monitoring and scientific research
2	Establishing National legislations, Survey and Certification	Compliance monitoring and enforcement	Contingency Plans, Preparedness, Awareness and additional measures
3	Approval for BWM Systems	Training of Port State Control Officers (PSCO)	Risk assessment, Exemptions and determination of designation areas
4	Training of crew members	Regional and International Cooperation	Detection and investigation of violations and notification
5	Violations detection, sanction and investigation	Sediments Reception Facilities	Regional and international cooperation

Sources: (Baumler, 2016)

Risks relating to maritime traffic

Figure 1-2.

According to the statistics of the Sri Lanka Ports Authority, there are about 300 vessels passing daily through the southern off shore, Sri Lanka providing naval link between Europe, South & West East Asia [20]. Also, oil tankers from the Middle East to Far East countries pass via this shipping route. Therefore, there is a high risk of oil pollution in Sri Lankan waters [21].

According to the studies of blue whales, the offshore southern area is highly populated by *Balaenoptera Sps*. Recent observations of dead whales in the vicinity overlap with the highly productive whales feeding ground and the shipping lanes results in ship strikes [22].

Also, the NO₂ concentration of this shipping route is at a very high range due to the high vessel traffic as well. [23].

Risks relating to ecosystems

Sri Lanka have been identified as one of the 34 global biodiversity hotspots with a high concentration of endemic species. This area is also identified as one of the eight biodiversity hotspots based on a number of endemic plants and vertebrates [24]. In addition to that,

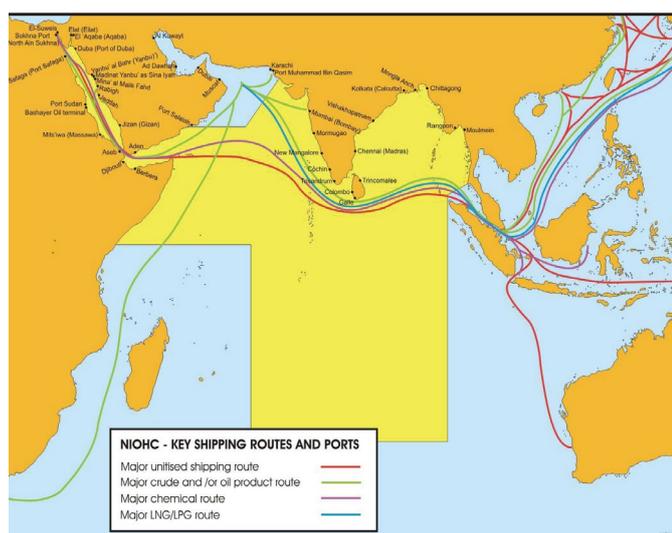


Figure 1: Major shipping routes (South East Asia)

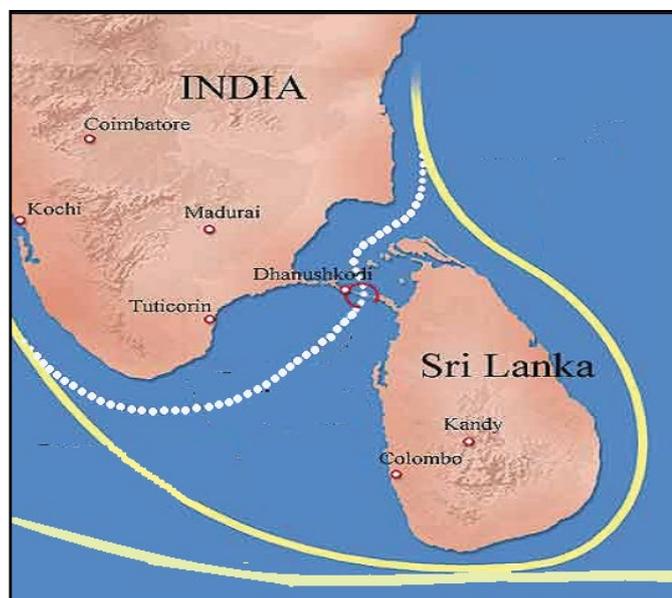


Figure 2: International shipping routes near to Sri Lanka

the coastal waters of the country are highly productive [25].

In general, more than 4,000 ships arrive in Sri Lankan ports annually. Conventional ships, Containers, Oil & gas tankers and RO-RO ships are among them. Sri Lankan waters receive an estimated 825,600 MT of ballast water annually [26]. This may cause a threat to the Sri Lankan marine ecosystems, economy and human health by HAOP. The WWF's Global 200 Eco-region Project has identified as vulnerable so that, given highest priority for conservation [27].

These ecosystems and the biota are vulnerable to sea level rise with regards to climate change. Also, this rich biota effects and is vulnerable to human activities, particularly to marine pollution by different ways.

Existing marine invasions

Researchers from 3 Universities have carried out work on the introduction of HAOP through ballast water in to Colombo harbor waters. According to these studies, the invasive species density of the invasive species density of the Colombo waters is increasing with time [28].

Two IAS species were reported recent studies as *Semibalanus balanoids* (Australian acorn barnacle) and *Crassostrea virginica* (Oyster) at Beruwala fishery harbor in Western coastal area [29]. According to the records of port Biological Baseline Survey (PBBS) in Colombo harbor, there were 5 invasive species of phytoplankton among the 125 different phytoplankton species identified. In addition to that 11 harmful non-native dinoflagellates were recorded in the study [30].

The non-indigenous highly invasive *Schizoporella errata* were reported in 2014-2015 for the first time in the Colombo harbor [31].

According to the above information, it's clear that the distribution of marine invasive species to control and finally eradicate the HAOP in Sri Lankan waters.

Distribution of maritime related responsibilities in Sri Lankan shipping administration

There are 4 different organizations involve in maritime and shipping administration as Flag State, Port State and Coastal State. Merchant Shipping Secretariat (MSS) and Marine Environment Protection Authority (MEPA) are involved in Flag State responsibilities while Sri Lanka Ports Authority (SLPA) and Sri Lanka Coast Guard Department (CDG) are involve in Port State responsibilities. Also, MEPA and CDG are involved in Coastal State responsibilities. The year 2015 onwards, the SLPA and MSS are functioning under the Ministry of Highways, Ports and Shipping. In the meantime, the MEPA is functioning under the Ministry of Mahaweli Development and Environment and the CDG is functioning with the Ministry of Defense.

Agencies Dealing with Flag state Responsibilities

As Flag State, the overall activities on maritime administrations are vested with the Merchant Shipping Act No. 52 of 1971. The Merchant Shipping Secretariat (MSS) deals with the registration of ships under Sri Lanka flag, Survey of the ships and Certification. In addition, the Licensing of Shipping Agents act No. of 1972 and the relevant clauses of the Admiralty Jurisdiction Act No. 40 of 1983 with related regulations made for proceeding violations and the better governance of the shipping field.

MEPA is the responsible agency for preparation the legal framework on BWB.

Agencies dealing with Port State responsibilities

Sri Lanka Ports Authority (SLPA) is the responsible agency for these actions with the assistance of SLCG. As Port State (PS), SLPA

is responsible for the protection of port areas and socio-economic activities and Compliance Monitoring & Enforcement (CME) with this shipping industry. SLPA also responsible on the establishment of port reception facilities, provide training for PSCO and international cooperation.

SLPA is obliged to take necessary judiciary actions on illegal removal of any harmful matters to the port premises.

Agencies dealing with Coastal States responsibilities

As Coastal State, Marine Environment protection Authority (MEPA) is the main responsible agency to carry out scientific research & environmental monitoring, preparedness and public awareness, risk assessments & grant exemptions and regional & international cooperation. All of these activities to be done with the assistance of SLPA, MSS and research institutes as well.

Sri Lanka Coast Guard (SLCG) is responsible for collaboration with other responsible agencies in the implementation and monitoring of measures required for the prevention of marine pollution and also responsible for cooperate with research activities. In addition to that, SLCG has powers to inspect certificates, license, permits and records. Also, SLCG has power to stop, enter, board search the vessel and to arrest and detain.

Evaluation of Sri Lankan status for the preparedness for the ratification of BWMC

Initiatives taken in the implementation of BWMC

When considering the address of HAOP issue, Sri Lanka has been taking a few initiatives to implement the BWM Convention. As a Flag State following steps were completed in the ratification process.

1. The basic policy decision for the ratification was taken.
2. drafted the NBWM Strategy in 2013,
3. Establishment of NBWM Task Force in 2013
4. Economic evaluation for the cost benefit analysis have been carried out in 2016 [29].

Few marine ecosystems survey programs and a few PBBS programs were carried out while maintaining international and Regional cooperation with SACEP and IMO.

Sri Lanka has been taken few initiatives to establish the sediment reception facility [29].

Development of National Ballast Water Management Strategies (NBWMS)

In general, management of IAS is commonly covered in the CBD and Sri Lanka is a party to this convention. The Ministry of Mahaweli Development and Environment is the responsible agency for the related actions of CBD and the Strategic Action Plan on this regard is finalized accordingly [32-35]. But to direct address for IAS is needed, so that the country initiated the drafting of NBWMS, establishment of National Ballast Water Management Task force and economic assessment on the ratification of the convention.

The NBWMS was prepared by MEPA in 2013 and yet to be finalized. In the NBWMS of Sri Lanka, national action plan was proposed and seven national strategies identified and prioritized as follows:

Strategy 1: Comply with the guidelines as per the Convention

Strategy 2: Capacity building on scientific knowledge and institutional strengthening

Strategy 3: Develop advanced knowledge on IAS/HAOP and carry out scientific researches in Sri Lankan waters.

Strategy 4: Risk assessments; decide designated areas and CME

Strategy 5: In cooperation with South Asian Regional BWM program

Strategy 6: Review and assess the NBWMS

Strategy 7: Make necessary measures to identify adequate resources to implement national strategy

The proposed Action Plan in the draft NBWMS shows in table 2 below, reflects the actions from ratification up to the implementation of the BWM procedures in all ports in Sri Lanka [36,37].

National BWM Task Force

In Sri Lanka, the NBWTF was established in 2013 and the representatives from following institutions mentioned in the Table 3

Table 2: Summary of the Action Plan for the implementation of MWM procedures in Sri Lanka.

Action point	Time Frame - Year				
	2013	2014	2015	2016	2017
Establish National Taskforce	✓	✓			
Implement Capacity building program		✓	✓		
Establish certification procedure		✓	✓	✓	
Set up a web base system for ballast water discharge notification and other information exchange	✓	✓	✓	✓	✓
Carry out PBBS and RA programs	✓	✓	✓	✓	✓
Raise Awareness of Ballast Water issue and IAS issue	✓	✓	✓	✓	✓
Regional and international coordination	✓	✓	✓	✓	✓
Implementation		✓	✓	✓	✓

Source: Draft (NBWMS Sri Lanka, 2013)

Table 3: Stakeholder group for the BWM and NBWTF and their responsibility.

Organization	Role
Marine Environment Protection Authority	Implement the national strategy, Establish national legislations and Implement ballast water management activities to all ships calling Sri Lankan ports, Administration of relevant international instrument, International and Regional Cooperation, Develop research and technologies for BWM and Ensure and continuous monitoring.
Merchant Shipping Secretariat	Aware Sri Lankan ships on the requirements of BWM, Assist to execute BWM inspections & CME. Issue approval for the BWM Plan. Issue certificates related to the BWM to ships flying with Sri Lankan flag, Issue type approval certificate to BWTS after obtaining of recommendation of MEPA.
Ministry of Environment-Biodiversity Secretariat	Consulting to the lead agency, Control land based invasive species and integrates with the NBWMS.
Ministry of Agriculture	Control land base invasive species Integrated the activities with the NBWMS
National Aquatic Resources and Research Development Agency	Consulting to the lead agency, Assist to carry out the PBBS, Reporting invasive species detected.
Sri Lanka Coast Guards	Controlling the ballast water discharge in certain areas
Ceylon Association of Ship Agents	Assist to MEPA on ship inspection activities, Completion of the online BW notification form.
Sri Lanka Ports Authority	CME of the BWM of ships that enter to the Sri Lankan Ports. Giving permission to ships with respect to the ballast water reporting forms. Cooperation with the PBBS to carry out research on HAOP. Aware of ship owners on implementation of BWM activities who visits to Sri Lankan ports.
Ministry of Fisheries and Aquaculture	Control IAS from aquaculture activities, Aware fishermen on IAS issues
Ministry of Tourism	Consulting to lead the agency, Assists lead agency to raise awareness building.
Universities	Consulting to the lead agency, Assist to carry out the PBBS, Reporting invasive species detected.
Shipbuilding and ship repair yards	Provide sediment reception facilities to the ships, Coordinating the installation of BW treatment equipment to the ships.
Ship Owners Association & NGOs	Assist to the PBBS, Raising awareness on the IAS issue among the Shippers

Source: Draft (NBWMS of Sri Lanka, 2013)

were included. These institutions are responsible for specific tasks at the institutional level, but the lead agency has overall responsibility for the BWM.

According to the responsibilities of NBWTF, the group of organizations is responsible for the formulation of NBWMS and evaluates the status of implementation and revision of the NBWMS whenever necessary [38-40]. Also, the development and implementation of the Action Plan provides guidance, oversight, and advice to take measures to properly implement and finally eradicate HAOP [41].

Table 4 reflects the current overall situation of implementation of national strategic framework of Sri Lanka.

Present Evaluation of Sri Lanka to Comply with BWMC requirements

The table 5 shows the current situation of Sri Lanka that proceeding steps to ratification process.

Discussion

To maintain the stability and structural integrity, ships needs to carry ballast water. Ballast water is one of the major pathways to the introduction of IAS & HAOP to new environments.

In order to minimize this issue, IMO has adopted the BWMC that includes several regulations and guidelines. According to the Convention, it demands several requirements to the management of ballast water. Each ship needs to on board implementation of BWMP, which should explain the actions to be taken to the management of ballast water. Furthermore, the ship should implement the BWRB on board and it should be updated on the BWM.

According to the Convention a ship either follows D-1 or D-2 standards to manage the ballast water. D-1 standards follow ballast water exchange methods at mid-ocean while D-2 standards follow treatment technologies on board. In addition, States have to establish sediment treatment facilities to safely dispose the ballast water sediments.

However, while the application of both D-1 and D-2 methodologies introduced by the Convention, noticeable risks to the environment as well as the safety of the crew and the ships have been identified. Some of the identified obstacles such as technical, legal and economic challenges are delaying the requirements of the ratification of the Convention.

States have to harmonize their domestic law with international regulations regarding marine environment protection. According to the international laws, the States obligations can be distributed as Flag State, Port State, and Coastal State.

All ships have to be registered in a State. It is the Flag State which effectively exercises its jurisdiction and control in administrative, technical and social matters over ships flying its flag. In the context of BWM, the Flag State has specific responsibilities such as ship survey & certification, training of crew, approval of BWMS and transfer of technology to other member States.

To comply with the BWMC, Port States have to develop CME regime. Inspections of ships, Sediments reception facilities, Communication of requirements to IMO and regional cooperation for Port State Control via MoU and international cooperation for the designation of areas for ballast water exchange is the other main role for Port States.

To comply with the BWMC, the Coastal State should establish and implement policies and guidelines to the implementation and enforcement procedures in their territory with the responsible organizations in the State. The supervision of coastal areas and its

Table 4: Current status of implementation of national strategic framework in Sri Lanka.

Step	Current situation	Evidence
Step 1: Political decision	Yes	Basic policy decision-2012
Step 2: Gather information and develop national policy, strategy and action plan	Under way	Draft BWMS of Sri Lanka developed in 2013
Step 3: Draft enact & implement legislations and effect institutional reform	No	Through Information
Step 4: Implement strategy and action plan	Under way	Draft action plan prepared
Step 5: Monitor and evaluate system	No	Through information

Source: By the author

Table 5: Evaluation of Sri Lanka to Comply with BWMC requirements.

State category	Responsibility	Situation (Yes/No)	Expected responsible organization	Reason	Recommendation
Flag State Requirements	Protection and Guidance for National fleet	No	MSS	Not ratified the BWMC	Ratify the BWMC
	Establishing National legislation & related activities/ Survey & Certification	Yes	MSS & MEPA		Incorporate regulations to the MPP Act
	Approval of BWM Systems	No	MSS	Not ratified the BWMC	Ratify the BWMC
	Training of crew members	No	MSS	Not ratified the BWMC	Ratify the BWMC
	Violation detection and sanction	No	MSS, MEPA & CGD	Not ratified the BWMC	Ratify the BWMC
Port State requirements	Compliance monitoring and enforcement	No	SLPA	Not ratified the BWMC	Ratify the BWMC
	Sediments Reception Facilities	Yes	SLPA	-	Ratify the BWMC
	Training of Port State Control Officers	No	SLPA & MEPA	Not ratified the BWMC	Ratify the BWMC and train relevant officials
	Regional and International Cooperation	Yes	SLPA & MEPA	-	
Coastal state requirements	Scientific research & environmental monitoring	Yes	MEPA	-	
	Preparedness and Public Awareness	Yes	MEPA & SLPA	-	To be improved
	Risks Assessments & grant Exemptions	No	MEPA & MSS	Not ratified the BWMC	To start risks assessments process
	Violation detections	No	MEPA, SLPA & CGD	Not ratified the BWMC	Ratify the BWMC
	Regional and international Cooperation	Yes	MEPA, SLPA & CGD	-	To be improved

Source: By the author

availability as well as issuance of exemptions and preparation of contingency plan, are part of its main obligations.

The overall effort of these three institutions should be to cooperate regionally and internationally to successfully manage BW and eradicate HAOP from their territory.

In Sri Lankan context, because of the unique location of this island, it has significant importance to the shipping industry at the global level by providing a link between Europe, and South & West East Asia. Because of this reason, high vessel traffic can currently be seen within the international shipping route which passes approximately 19 nautical miles from the southern coast of Sri Lanka.

There are 5 commercial ports currently functioning around the country, while the port of Colombo, the main port, receives around 4500 ship calls per annum. During the operations of these vessels, Sri Lankan ports receive a considerable amount of ballast water, which may introduce HAOP to Sri Lankan waters.

Sri Lanka is identified as a biodiversity hotspot as a global level. There are a variety of marine ecosystems found around the country, which are directly linked with the country's economy and wealth. During the past decade, some investigations are made to identify the risk of ballast water and introduction of HAOP. There is evidence of the IAS in Sri Lankan waters through ballast water accordingly.

Sri Lanka's leading agency to address this issue is MEPA. Accordingly, MEPA is preparing a NBWMS and a NBWMTF. Sri Lanka has completed PBBS in all ports and is currently finalizing the reports. The country is also finalizing the cost-benefit analysis of the ratification process of the convention. Few initiatives have been taken for reception facilities for ballast water sediment treatments.

As a developing country, Sri Lanka is facing some difficulties including financial, technical, skilled personnel and legal constraints in the ratification process of the Convention. This situation leads to delays of the implementation process.

Conclusion and Recommendations

Due to high risk for the country, immediate ratification of the BWMC is recommended for Sri Lanka that will fulfill all of the requirements of the convention.

MEPA should incorporate the proper regulation scheme to the Marine Pollution Prevention Act No. 35 of 2008 with regard to the proper management of the BW issue. This should be developed for violation- detections, compliance monitoring, system approvals and cover all the Flag State, Port State, and the Coastal State requirements.

The collaborative-joint scientific research program within the South Asian Region is recommended as the best solution to enhance research skills and maintain a baseline data of the marine ecology of the region.

MEPA should get assistance from the GloBallast Partnership Project of IMO or Integrated Technical Cooperation Programme of IMO to finalize the drafting of National Ballast Water Management Strategy.

It is necessary to establish an efficient funding mechanism to develop risk assessment and monitoring systems with regard to the IAS & HAOP issue. Also, a comprehensive National marine conservation policy is needed for proper ocean governance which includes addressing the IAS & HAOP issue.

As the leading agency, MEPA should enlighten relevant officials in stakeholder agencies, as well as all the technical staff of the MEPA itself, with regard to the IAS & the HAOP issue.

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