

2014

NATIONAL BALLAST WATER MANAGEMENT STRATEGY (GHANA)



Prepared By:

Elvis Nyarko

Josephine Nkrumah

Ben Owusu-Mensah

Table of Contents

1.0	Executive Summary	1
2.1	Glossary	4
3.0	Introduction	6
3.1	Background to the issue of IAS	6
3.2	Background to the Issue of Ballast Water Management	7
3.3	International, regional, national obligations.	9
3.4	Relevance of Ballast Water as a vector of IAS to Ghana	12
4.0	Purpose of the strategy	16
4.1	Why the strategy has been written	16
4.2	Guiding Principles	16
6.0	Invasive Alien Species	21
6.1	Study on the magnitude of ballast water as an IAS vector	21
6.2	Ghana’s International Obligations	21
6.3	Responsible Agency or Department	22
6.4	Evaluation and Monitoring of Ports	23
7.0	Ballast Water Management	24
7.1	Agency or Department that is responsible	24
7.2	Ballast Water Management Plan	24
8.0	Implementation Plan	25
8.1	Institutional Arrangements	26
8.4	Communication, Awareness Raising and Training.	30
9.0	Funding	31
9.1	Implementation Funding (Initial 2 – 5 years)	31
9.2	On-going Funding	32

1.0 Executive Summary

Invasive alien species (IAS) are species whose introduction and/or spread outside their natural past or present distribution threaten biological diversity. IAS occurs in all taxonomic groups, including animals, plants, fungi and microorganisms, and can affect all types of ecosystems. For an alien species to become invasive, it must arrive, survive and thrive. Common characteristics of IAS include rapid reproduction and growth, high dispersal ability, phenotypic plasticity (ability to adapt physiologically to new conditions), and ability to survive on various food types and in a wide range of environmental conditions.

One of the primary means by which marine IAS is transferred into new environments is via the ballast water of ships. Shipping moves over 80% of the world's commodities and transfers approximately 3 to 5 billion tons of ballast water internationally each year. A similar volume may also be transferred domestically within countries and regions each year. Ballast water is absolutely essential to the safe and efficient operation of modern shipping, providing balance and stability to un-laden ships. However, it may also pose a serious ecological, economic and health threat. It is estimated that at least 7,000 different species are carried in ships' ballast tanks around the world.

The issue of marine IAS has emerged as a global topical issue because of the potential threat it poses to the marine ecosystem and sustainable development of natural resources in general. The global community has over the years taken steps to control this threat culminating in the adoption of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (BWM Convention). As at January 2013, 38 States had ratified the BWM Convention representing 30.38% of world tonnage, The convention will come into force 12 months after 30 states representing 35% of world tonnage have ratified same.

In Ghana, 85% of international trade by volume is carried by sea which implies a great risk of exposure to marine IAS. However, as a nation, no serious steps have been taken to address the issue. Currently, both Ghana Ports & Harbours Authority and Ghana Maritime Authority have no records on ballast water management practices by ships calling Ghanaian ports. Ghana is currently taking steps to ratify the BWM Convention. In order to fully implement a legal regime that properly manages the issue of ships' ballast water, it would be necessary for Ghana to take immediate steps to ratify this Convention. This would enable the translation of the convention into domestic legislation in order to ensure its application in the country. Ghana has ratified other environmental treaties which have some relevance to the issue of IAS but not specifically with ballast water as a vector.

The recent discovery and drilling of oil in commercial quantities coupled with the increases in imports and exports will undoubtedly lead to increased shipping traffic calling at the sea ports of Ghana. As national trade and traffic volumes expand, so will the harmful effects of these activities, especially, the potential transfer of IAS through ship's ballast water which will pose a major threat to the country's marine environment.

The Ghana Maritime Authority which is mandated by section 2(j) of the Ghana Maritime Authority Act, 2002 (Act 630) '*...to pursue the ratification or accession and implementation of international maritime conventions in conjunction with the appropriate ministry...*' must take steps to ratify the BWM Convention. This should be followed by the enactment of a National Ballast Water Management Act. Ghana has no prescribed BWM Plan, Record or Certificate, so the national legislation on ballast water management should formulate an approved standard plan in accordance

with prudent measures laying down the requirements for such prescriptions to be issued by a relevant agency.

In order to arrive at the desired level of enacting national legislation, it is necessary to develop a national strategy and its implementation plan which will determine all the legislative, procedural and other requirements for the implementation of the strategy. The issue of ballast water management must necessarily receive a multi-faceted approach involving inter-sectoral agencies and institutions. These would include the following:

- Ghana Maritime Authority (GMA)
- Ghana Ports & Harbours Authority (GPHA)
- Environmental Protection Agency (EPA)
- Fisheries Commission of the Ministry of Fisheries and Aquaculture
- Academic and Research Institutions (including Department of Marine and Fisheries Sciences (formerly Oceanography and Fisheries) of the University of Ghana, Regional Maritime University (RMU), Water Research Institute (WRI)
- Guinea Current Large Marine Ecosystem (GCLME)

It is crucial to place a high priority on raising awareness about the problem of harmful aquatic organisms transported in ships' ballast water. Awareness raising products from the relevant institutions must be made available to all stakeholders, especially the shipping companies. The public (especially coastal inhabitants) who will be the most affected by the adverse effects of IAS must essentially be educated, informed and trained by various relevant sectors to ensure early detection and reporting mechanisms.

This strategy envisages that funding to address its implementation should be sourced from multi donor agencies both foreign and local to ensure effective implementation and capacity building for key technical experts and personnel.

2.0 Acronyms

BWM Convention	International Convention for the Control of Ships Ballast Water and Sediments, 2004
BWM	Ballast Water Management
CLC	Civil Liability Convention
EPA	Environmental Protection Agency
FPSO	Floating Production Storage and Off-loading vessel
FSSD	Fisheries Scientific Survey Division
GloBallast	GEF/UNDP/IMO Global Ballast Water Management Programme
GMA	Ghana Maritime Authority
GPHA	Ghana Ports & Harbours Authority
GCLME	Guinea Current Large Marine Ecosystems
GRT	Gross Registered Tonnage
GMNOA	Ghana Merchant Navy Officers Association
GNPC	Ghana National Petroleum Corporation
GHACEM	Ghana Cement Company
IMO	International Maritime Organisation
ICZM	Integrated Coastal Zone Management
IAS	Invasive Alien Species
LSCI	Liner Shipping Connectivity Index (LSCI)
MOT	Ministry of Transport
MESTI	Ministry of Environment Science, Technology & Innovation
MARPOL	Marine Pollution Convention
NDPC	National Development Planning Commission
NOBOD	No Ballast On Board
OPRC	Oil Pollution Response Convention
PBBS	Port Biological Baseline Survey
PSP	Paralytic Shellfish Processing
PNDC	Provisional National Defence Council
SOAAG	Shipowners and Agents Association of Ghana
TOR	Tema Oil Refinery
TEU	Twenty Equivalent Units
UNCLOS	United Nations Convention on the Law of the Sea, 1982
UNCTAD	United Nations Conference on Trade and Development
UNEP	United Nations Environment Programme
RMU	Regional Maritime University
WRI	Water Research Institute

2.1 Glossary

Ballast Water	Any water and associated sediment used to manipulate the trim and stability of a vessel
Bioinvasion	A broad based term that refers to both human-assisted introduction and natural range expansions
Container	An object (large metal box) that can be used to hold things, and can be loaded from one transport mode to another
Container vessel	A cargo ship designed to hold containerized cargo
Convention	A formal agreement or contract of sovereign States
Cryptogenic species	A species that is not demonstrably native or introduced.
Disease	Clinical or non-clinical infection with aetiological agent.
Domestic legislation	The statutes, laws, regulations and legislative instruments of a State
Freight Forwarder	A person or company that organizes shipments for individuals or other companies and may also act as a carrier
Invasive species	An established introduced species that spreads rapidly through a range of natural or semi-natural habitats and ecosystems, mostly by its own means.
Liner Shipping	Shipping conducted on predetermined routes and advertised dates
Marine Pest	A harmful introduced species (i.e. an introduced species that threatens human health, economic or environmental values)
Non- Invasive	An established species introduced that remains localised within its new environment and shows minimal ability to spread despite several decades of opportunity.
Native marine species	A marine species with a long natural presence that extends into the pre-historic record
Port Biological Baseline	A biological Survey to identify the types of introduced marine species in a port
Stevedoring	Loading and unloading of cargo ships
Shipping	Carriage of goods and passengers by sea
Shipping Agency	Agent of ship owners in ports
Pathogen	A virus, bacteria or other agent that causes disease or illness.
Risk	The likelihood and magnitude of harmful event

Risk Assessment Risk Analysis	Undertaking the tasks required to determine the level of risk. Evaluating a risk to determine if, and what type of, actions are worth taking to reduce the risk.
Ratification	The act of a sovereign State to be bound by the terms of a treaty or convention by signing to that treaty or convention.
Treaties	See <i>Convention</i>
Unintentional Introduction	An unwittingly (and typically unknown) introduction resulting from a human activity unrelated to the introduced species involved (e.g. via water used for ballasting a ship or for transferring an aquaculture species).

3.0 Introduction

3.1 Background to the issue of IAS

IAS are species whose introduction and/or spread outside their natural past or present distribution threaten biological diversity. IAS occurs in all taxonomic groups, including animals, plants, fungi and microorganisms, and can affect all types of ecosystems. While a small percentage of organisms transported to new environments become invasive, the negative impacts can be extensive and over time, these additions become substantial. If a species' new habitat is similar enough to its native range, it may survive and reproduce. However, it must first subsist at low densities, when it may be difficult to find mates to reproduce. For a species to become invasive, it must successfully out-compete native organisms, spread through its new environment, increase in population density and harm ecosystems in its introduced range. For an alien species to become invasive, it must arrive, survive and thrive.

Common characteristics of IAS include rapid reproduction and growth, high dispersal ability, phenotypic plasticity (ability to adapt physiologically to new conditions), and ability to survive on various food types and in a wide range of environmental conditions. A good predictor of invasiveness is whether a species has successfully or unsuccessfully invaded elsewhere.

Ecosystems that have been invaded by alien species may not have the natural predators and competitors present in its native environment that would normally control their populations. Native ecosystems that have undergone human-induced disturbance are often more prone to alien invasions because there is less competition from native species. A species introduction is usually vectored by human transportation and trade. The increased mobility of people and their goods bring an increased likelihood of movement of species around the planet, either deliberately in the form of commodities such as livestock, pets, nursery stock, and produce from agriculture and forestry, or inadvertently as species are transported in packaging, ballast water, and on the commodities themselves.

A huge amount of global trade is seaborne, and marine organisms are transported around the world in ballast water, as ships take on ballast in one port and discharge it in another part of the world. Ballast is a particularly important vector of invasive species in coastal waters. The introduction of invasive marine species into new environments by ships' ballast water attached to ships' hulls and via other vectors has been identified as one of the four greatest threats to the world's oceans. The other three are land-based sources of marine pollution, overexploitation of living marine resources and physical alteration or destruction of marine habitat.

Through shipping approximately 3- 5 billion tonnes of ballast water are transferred internationally each year and a similar volume may also be transferred doMESTIcally within countries and regions each year. Ballast water is absolutely essential to the safe and efficient operation of modern shipping by providing balance and stability to un-laden ships. However, it may also pose a serious ecological, economic and health threat. Ships have carried solid ballast, in the form of rocks, sand or metal, for thousands of years. In modern times, ships use water as ballast.

Water is much easier to load on and off a ship, and is therefore more efficient and economical than solid ballast. When a ship is empty of cargo, it fills with ballast water. When it loads cargo, the ballast water is discharged. There are thousands of marine species that may be carried in ships' ballast water; basically anything that is small enough to pass through a ships' ballast water intake ports and pumps. These include bacteria and other microbes, small invertebrates and the eggs, cysts and larvae of various species. The problem is compounded by the fact that virtually all marine

species have life cycles that include a planktonic stage or stages. Even species in which the adults are unlikely to be taken on in ballast water, for example because they are too large or live attached to the seabed, may be transferred in ballast during their planktonic phase.

It is estimated that at least 7,000 different species are carried in ships' ballast tanks around the world. The vast majority of marine species carried in ballast water do not survive the journey, as the ballasting and deballasting cycle and the environment inside ballast tanks can be quite hostile to organism survival. Even for those that do survive a voyage and are discharged, the chances of surviving in the new environmental conditions, including predation by and/or competition from native species, are further reduced. However, when all factors are favourable, an introduced species may survive to establish a reproductive population in the host environment. It may even become invasive, out-competing native species and multiplying into pest proportions. As a result, whole ecosystems can be changed

In several countries, introduced, microscopic, 'red-tide' algae (toxic dinoflagellates) have been absorbed by filter-feeding shellfish, such as oysters. When eaten by humans, these contaminated shellfish can cause paralysis and even death. The list goes on, hundreds of examples of major ecological, economic and human health impacts across the globe. It is even feared that diseases such as cholera might be able to be transported in ballast water. There are hundreds of other examples of catastrophic introductions around the world, causing severe human health, economic and/or ecological impacts in their host environments.

3.1.1. IAS in Ghana

IAS has emerged as a topical issue in Ghana as a result of the threat they pose to sustainable development of natural resources in general. Non-native (alien) species has been introduced both accidentally and intentionally into the country's marine ecosystem with other goods, and in the case of marine IAS, through ballast water of ships. Even though it is reported that only a small percentage of these alien species are potentially invasive, when they do their impact is immense, insidious and usually irreversible, and may be as damaging to marine native species and ecosystems as the loss and degradation of habitats.

Currently invasive aquatic species such as *Eichhornia crassipes* (Water hyacinth), *Salvinia molesta* (Kariba weed), *Pistia stratiotes* (Water lettuce) and *Vossia cuspidata* (Hippo grass) have seriously invaded the Tano River and Tano/Aby/ Ehy lagoon complex.

In the marine environment, algal blooms caused by the filamentous green alga *Enteromorpha flexuosa*, known locally as "green-green" occur between December and February annually since 1993, in the western region of Ghana. The algal bloom has now been reported in rivers and wetlands of the Amanzule at Bakanta and Ankobra at Sanwoma respectively. It is generally suspected that the algae grows and blooms in an organic nutrient-rich Ivorian lagoon, most likely the Abidjan lagoon, and is dislodged and washed into the marine environment during the major rains in April-June and September-October/November. The easterly movements of the Gulf of Guinea ocean currents then drive the algal bloom into Ghanaian waters.

3.2 Background to the Issue of Ballast Water Management

Ballast water is held in the ballast tanks and cargo holds of ships to provide stability and maneuverability during a voyage when ships are not carrying cargo or are not carrying heavy enough

cargo, or require more stability due to rough seas. Ballast water may be either fresh or saline. Ballast water may also be carried so that a ship rides low enough in the water to pass under bridges and other structures. Ballast water management (BWM) for vessels includes all measures that aim to prevent unwanted aquatic nuisance species from being transported from foreign ports to a ship's port of call during ballast water discharge. Seaports in which ships exchange ballast water daily are at severe risk of invasions. Organisms transported to a port of call from foreign harbors with similar physiochemical characteristics (e.g., water temperatures, salinity regimes) pose an especially high risk of invasion. Even if only a tiny proportion of newly arriving non-native species survive in new habitats, the actual number of successful invasive species can be very large.

There are several different ways of managing ballast water. Currently, the most widely used is ballast water exchange. Ballast water exchange means that ships on their way to the next port release the lower-salinity coastal water they brought aboard and replace it with higher-salinity open-ocean water. Although this measure is not perfect, it reduces the number of potentially invasive species in the ballast tanks and replaces them with oceanic organisms that are less likely to survive in the lower-salinity near-shore waters of the ship's next port. However, organisms with a wide tolerance for differing salinities may survive ballast water exchange, especially any such organisms that may reside in the 'unpumpable' residual water and sediment remaining in the tanks during any ballast water exchange.

Another approach to BWM is through ballast water treatment. Ballast water treatment is the subject of extensive current research and development, and several technologies and methodologies have been proposed. These include mechanical methods (e.g., filtration and separation), physical methods (e.g., sterilization by ultraviolet light, ozone, heat, electric current, or ultrasound), and chemical methods (using biocides). In addition, treatment may combine several of these methods. Treatment may be an appropriate management option on occasions when vessels temporarily operate without ballast — a "no-ballast-on-board" (NOBOB) situation. When a ship is operating at NOBOB, it presents unique treatment problems because large numbers of organisms can reside in the 'unpumpable' residual water and sediment remaining in the ballast tanks. Few of the tested methodologies have been applied to the control of organisms in NOBOB situations. The treatment option favored by many ship operators because of its intrinsic simplicity and relatively low cost is the biocide approach, whereby chemical agents are added to the ballast water to minimize the number of viable organisms. This approach also has the potential to address the NOBOB condition. Concerns remain relating to establishing and enforcing standards for the appropriate disposal of biocide-treated ballast water and sediments.

3.2.1 The International Response

The member countries of IMO developed "Guidelines for the Control and Management of Ships' Ballast Water, to minimize the transfer of harmful aquatic organisms and pathogens". These Guidelines were adopted by the IMO Assembly in 1997, by resolution A.868(20). They replace earlier, less comprehensive Guidelines adopted in 1993. Management and control measures recommended by the Guidelines include, among others, undertaking ballast water management procedures, including:

1. Exchanging ballast water at sea and replacing it with 'clean' open ocean water. Any marine species taken on at the source port are less likely to survive in the open ocean, where environmental conditions are different from coastal and port waters;
2. Non-release or minimal release of ballast water; and
3. Discharge to onshore reception and treatment facilities.

These guidelines have now been replaced by the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 ('BWM Convention'). The BWM Convention was adopted at an IMO Diplomatic Conference on February 13, 2004, It will enter into force twelve (12) months after ratification by thirty (30) States, representing thirty-five per cent (35%) of world merchant shipping tonnage (Article 18, Entry into force)

Under Article 2 *General Obligations* of the BWM Convention, Parties (i.e States that are party to the BWM Convention) undertake to give full and complete effect to the provisions of the Convention and the Annex in order to prevent, minimize and ultimately eliminate the transfer of harmful aquatic organisms and pathogens through the control and management of ships' ballast water and sediments.

Parties are given the right to take, individually or jointly with other Parties, more stringent measures with respect to the prevention, reduction or elimination of the transfer of harmful aquatic organisms and pathogens through the control and management of ships' ballast water and sediments, consistent with international law. Parties should ensure that BWM practices do not cause harm to the environment, human health, property or resources, or those of other States. (www.globallast.imo.org).

The BWM Convention stipulates a set of requirements for the treatment process and "cleaning" of ballast water. The goal of these requirements is to ensure that at least 99.9% of all living organisms in ballast water are removed or killed before the water is discharged.

3.2.2 The Ghanaian Situation

The issue of ballast water has not received serious attention in Ghana. Both GPHA and GMA do not have records on ballast water management practices by ships calling Ghanaian ports. Inquiries from some shipping lines indicate that Maersk Line's mother vessels which do not call Ghanaian ports have ballast water treatment plants on board. However, their feeder vessels that call Ghanaian ports do not have ballast water treatment on board. To ensure proper handling of ballast water, they have ballast water management plans and ballast water logs on all their ships. They also seek to minimise the use of ballast water and to conduct internal and mid-ocean ballast exchange whenever possible. According to Maersk Line, they comply strictly with IMO guidelines and carry out their ballast water exchange, where necessary, at high seas, 200 nautical miles from shore or any island. Other shipping lines calling Ghanaian sea ports, Mediterranean Shipping Company (MSC), Grimaldi Lines, and Delmas all confirm that they have policies on ballast water exchange, and they carry out their ballast water management between 12 – 15 nautical miles off the coast.

As stated earlier Ghana has not signed, ratified or acceded to the BWM Convention. In order to fully implement a legal regime that properly manages the issue of ships' ballast water, it would be necessary for Ghana to take immediate steps to ratify this Convention. This would enable the translation of the convention into domestic legislation in order to ensure its application in the country.

3.3 International, regional, national obligations.

In 2011, a rapid status assessment of the environmental and legal framework of Ghana as well as an economic assessment in relation to BWM in Ghana was conducted. It revealed that Ghana has

ratified a number of environmental protection related treaties and conventions which have relevance to the issue of ballast water management. It must be pointed out that as a dualist state, in order for Ghana to enforce the legal and operational framework of such treaties and conventions; these have to be incorporated into domestic legislation.

3.3.1 Agreements or Treaties

See 3.3.2 below

3.3.2 Conventions

There are a number of international conventions and treaties on the environment which are relevant to the protection of the marine environment and include the following:

- a. International Convention for the Control and Management of Ships Ballast Water & Sediments
- b. Convention on Biological Diversity
- c. United Nations Convention on the Law of the Sea
- d. UNEP Regional Seas Conventions
- e. International Convention for the Prevention of Marine Pollution from Ships, 1973 as modified by the Protocol of 1978 relating thereto (MARPOL 73/78, Annexes I – VI)
- f. 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter (London Convention)
- g. International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties (Intervention Convention)
- h. Oil Pollution Preparedness Response and Co-operation Convention (OPRC)
- i. 1992 Civil Liability Convention (CLC 92)
- j. International Oil Pollution Compensation Fund, 1992 (Fund 92)

Brief reviews of some relevant ones are as follows:

Convention on Biological Diversity

The Convention on Biological Diversity entered into force on 29th December 1993, which was 90 days after the 30th ratification. Ghana was the 12th of 157 countries which signed the Convention on Biological Diversity during the Earth Summit in June 1992. Biodiversity - the variability within and among living organisms and the systems they inhabit - is the foundation upon which human civilization has been built. In addition to its intrinsic value, biodiversity provides goods and services that underpin sustainable development in many important ways, thus contributing to poverty alleviation. First, it supports the ecosystem functions essential for life on Earth, such as the provision of fresh water, soil conservation and climate stability. Second, it provides products such as food, medicines and materials for industry. Finally, biodiversity is at the heart of many cultural values.

In ratifying the Convention, the Parties have committed themselves to undertaking national and international measures aimed at achieving three objectives: the conservation of biological diversity; the sustainable use of its components; and the fair and equitable sharing of benefits arising out of the utilization of genetic resources. (www.cbd.int). In spite of Ghana being one of the early countries to ratify the Convention, it remains to be translated into domestic legislation.

United Nations Convention on the Law of the Sea

United Nations Convention on the Law of the Sea is presently binding for 154 States, as well as the European Community (as of 24 July 2008). It is considered the “constitution of the oceans” and represents the result of an unprecedented, and so far never replicated, effort at codification and progressive development of international law. (www.untreaty.un.org). This convention defines the rights and responsibilities of nations in their use of the world's oceans, establishing guidelines for businesses, the environment, and the management of marine natural resources. Ghana is a contracting party to this Convention having signed to the United Nations Convention on the Law of Sea on the 10th day of December, 1982 and ratified same on 7th June 1983. It has been passed into an Act of parliament as the Maritime Zones (Delimitation) Act, 1986, P.N.D.C. Law 159.

UNEP Regional Seas Conventions

UNEP Regional Seas Conventions aims to address the accelerating degradation of the world's oceans and coastal areas through the sustainable management and use of the marine and coastal environment, by engaging neighboring countries in comprehensive and specific actions to protect their shared marine environment. It has accomplished this by stimulating the creation of Regional Seas programmes prescriptions for sound environmental management to be coordinated and implemented by countries sharing a common body of water.

Ghana signed the Abidjan Convention on March 23, 1981 and ratified same on July 20, 1989. This convention has not been translated into Ghanaian legislation to date.

MARPOL 73/78

MARPOL 73/78 is the main international convention on the prevention of pollution of the marine environment by ships from operational or accidental causes. Its scope covers pollution by oil, chemicals, harmful substances in packaged form, sewage, garbage and air emissions. Its annexes also include regulations for the control of pollution by noxious liquid substances.

It should be pointed out that the Conventions listed in (e) – (j) above are currently incorporated in a national bill entitled the Marine Pollution Bill which is yet to be enacted into Ghanaian legislation. It is necessary for the quick passage of this bill into an act.

It is pertinent to note that all the environmental protected related conventions, treaties and agreements do not deal specifically with the issue of BWM. Whilst some of them make generic references to the marine environment as a whole, the issue of ship ballast has not been identified as a specific issue requiring any specific provision in its content or legal framework. Whilst this remains a fact, it is equally important that all these conventions are translated into domestic legislation to ensure a harmonized legal framework that protects the marine environment from all sources of harmful species, substance and or pollutants. The protection of the marine environment from a single source rather from a multi faceted approach will not achieve the desired effect of keeping the marine ecosystem safe.

3.4 Relevance of Ballast Water as a vector of IAS to Ghana

The introduction of non-native species via the discharge of ballast water is well documented. When vessels take on ballast water, aquatic organisms indigenous to that region are often found in the water. When the water is discharged in another region, the discharged aquatic life may then thrive and disrupt the local ecological system. Once organisms of this nature get introduced into the marine environment, they tend to establish, multiply in numbers and compete with native species ecosystem resources. It is at this stage that the alien species start becoming invasive. With over 85% of Ghana's international trade by volume being carried by sea, the issue of ballast water being a vector for the transfer of IAS into Ghana's marine and coastal environment remains very important.

3.4.1 History of the shipping industry and economic impact

Shipping plays an important role in the economy of the country - firstly, making international trade flows possible, and secondly being an integral part of the country's transport chain. Shipping is a major source of employment in the country, and a major generator of foreign exchange. In 2009 about 30 Shipping Agencies operated in the country. There were 560 companies registered as Freight Forwarders. The Ghana Ports & Harbours Authority had 2, 678 employees while the eight private stevedoring operators in the port employed about 587 workers. The Ghana Dock Labour Company, the main supplier of dock workers had 3,033 on its register.

Ghana currently has a total of 1,886,672 GRT on her register, out of 1,849,952 representing 334 vessels are fishing vessels, 31,029 GRT made up of 22 vessels are cargo vessels 5,691 GRT representing 53 vessels are small crafts. According to the 2008 UNCTAD Liner Shipping Connectivity Index (LSCI) Ghana is ranked 53 in the world. This represents a 42.6% improvement from 2004. This is a good indication of the economic impact of shipping activities in the country,

3.4.2 Environmental impact

In 2007, the Government announced the discovery of oil in large quantities about 60 km offshore in the western part of the country. Production commenced in the last quarter of 2010, and in line with this, a Floating, Production, Storage and Offloading (FPSO) vessel was acquired by the government to facilitate oil production and storage. The FPSO has an oil exploitation capability of 120,000 barrels per day and storage capacity of 1.6 million barrels and can produce 160 million standard cubic feet of gas per day. The FPSO is typically, a tanker that receives fluids from a sub sea oil well and processes the same on board to produce crude oil which is then offloaded unto shuttle tankers for refinery elsewhere. Seventeen modules, weighing more than 12,500 tons, have been installed on the FPSO. These include water treatment plant, crude separation plant, chemical injection plant, gas processing and injection plant, the turret, an electricity generation plant, and 120-room accommodation.

It can be said that this oil find, poses some challenges to the country's maritime industry. First there is the need to increase port facilities to service the industry due to the expected positive impact on the country's economy and international trade, and second is the impact the increase in shipping activities is going to have on the marine environment.

The Port Master Plan figures from GPHA show increase in imports and exports passing through the ports. Container traffic at the Tema port has risen by 56% since 2009, hitting 822,131 containers in 2012, according to the Ghana Ports and Harbours Authority (GPHA). Traffic is projected to reach 3 million by 2028. As national trade and traffic volumes increase, so will the harmful effects these

activities have on the marine environment. The problem of invasive species carried by ships from one part of the world to another will continue to be a major threat to the country's marine environment.

3.4.3 Public health issues

Invasive pathogens are of particular concern to human health relative to rapid environmental changes and ecological disturbances. As a result, the type, scale and tempo of change in health risks are accelerating under the contemporary conditions of global change. Introduction of non-human pathogens has been shown to cause extensive ecological and economic damage to industries such as aquaculture and commercial fisheries. In addition, the spread of human pathogens to new areas is considered to be a substantial human health risk.

Paralytic shellfish poisoning (PSP), for instance, results from the consumption of shellfish products contaminated with neurotoxins produced by certain species of phytoplankton (floating microscopic plants) within the group known as dinoflagellates. Globally, the distribution of toxic dinoflagellates has also been attributed to ballast water transfers, among other factors such as high nutrient levels that then stimulate growth of the newly introduced organisms. Several countries around the Pacific Ocean have experienced phenomenal population explosions of a number of toxic dinoflagellates thought to have been transported in an encysted state in ballast sediments. Such "red tides" (a term linked to coloration of the water by the microscopic toxic plants) make the shellfish in the area unsafe to eat for humans, and can also kill fish and invertebrate (crabs, etc.) in the area.

Exposure to cholera is another potential health-related ballast concern. In 1991 and 1992, *Vibrio cholerae* strain 01 was recovered from ballast, bilge and sewage water from five cargo ships docked in ports on the U.S. Gulf Coast. Four of these ships had taken on ballast water in cholera-infected countries (McCarthy and Khambaty, 1994; Tzankova, 2000). Following this incident, the Food and Drug Administration recommended that the U.S. Coast Guard issue an advisory to shipping agents and captains requesting that ballast water be voluntarily exchanged on the high seas before entry of ships into U.S.

Epidemics of diarrhoeal diseases remain a significant threat to public health in Ghana. Outbreaks of cholera are cyclical and the frequency of these outbreaks is increasing. Scenario analysis by the Ministry of Health (MOH) carried out in the early 2000s in Ghana indicates the possibility of diarrhoeal diseases increasing due to water scarcity and contamination. As cholera (*Vibrio cholera*) is known to mutate into new strains and travel widely in ship ballast, the introduction of virulent strains into Ghanaian coastal waters could pose a serious health threat. Additionally, the spread of toxic phytoplankton and increasing occurrence of harmful algal blooms in Ghanaian coastal waters could also be of significant health concern.

3.5 Geographical Scope of Ghana

The coastline of Ghana stretches for approximately 539 kilometres. According to the Maritime Zones (Delimitation) Law, 1986 (P.N.D.C.L. 159), Ghana has a territorial sea of 12 nautical miles, a contiguous zone of 12 nautical miles from the outer edge of the territorial sea or 24 nautical miles from the baseline from which the breadth of the territorial sea is measured. The exclusive economic zone (EEZ) of the Republic of Ghana is the area beyond and adjacent to the territorial sea which does not extend beyond the two hundred (200) nautical miles from the baselines from which the breadth

of the territorial sea is measured. The two major seaports are in the port cities of Tema and Takoradi as shown in Figure 1. Figure 2 shows the maritime delimitation zones of Ghana.



- **Map showing the coast of Ghana**

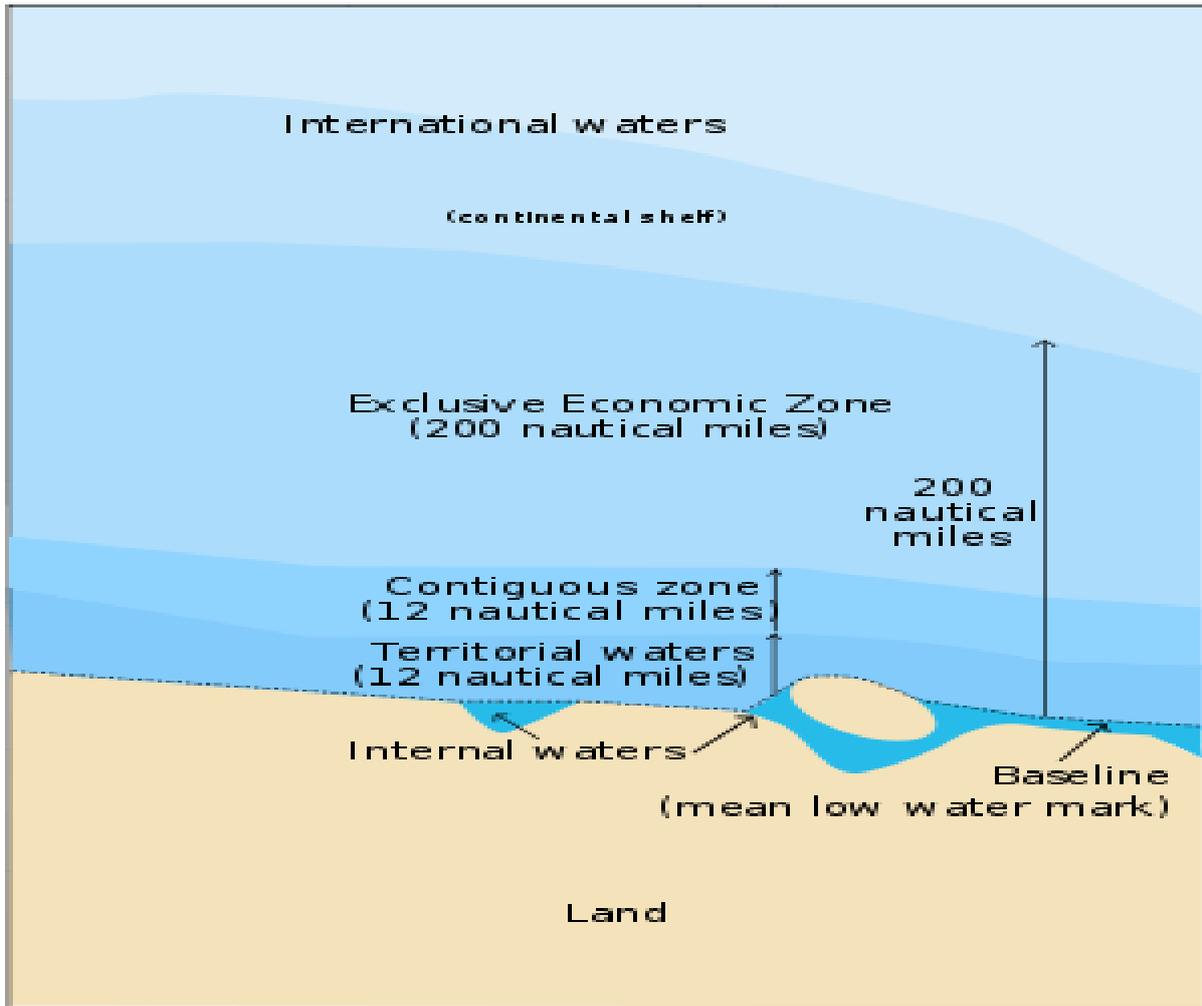


Figure 2. Maritime zones delimitation of Ghana

3.5.2 Technical scope

It is pertinent to note that the BWM Convention is regulatory in scope. This strategy's objectives are similarly based on the objectives of the BWM Convention. One of the roadmap components of this Strategy is to ensure the ratification of the BWM Convention by Ghana. The BWM Convention sets out strict treatment standards for ballast water discharges applying to different ships at different times depending on their construction date and their ballast water capacity. It further provides guidance for the type of approval of ballast water treatment systems. These requirements would be applicable to both national flagged ships and other ships governed by the BWM Convention and subject to Port State Control inspection procedures. The technical scope is in exact compliance with the BWM Convention and to ensure the enforcement of its requirements both in the form of preventive and punitive measures are uniform with global standards.

4.0 Purpose of the strategy

4.1 Why the strategy has been written

The primary purpose is first and foremost to reduce the risk of spreading IAS through ballast water. In so doing, the strategy aims at preventing adverse economic, environmental and public health impacts with strong regional collaboration in order to avoid activities that unduly hamper international trade.

The strategy is pivoted on finding the most practical means of approaching the issue of ballast water management in line with the capacities of the various relevant stakeholders.

4.2 Guiding Principles

There are various guiding principles which can be used to address the national ballast water management and related issues. These include the following:

- **The Precautionary Principle:** The Precautionary principle as stated in Principle 15 of the Rio Declaration provides an approach which indicates that a State should take steps to avoid irreversible harm to the environment irrespective of the fact there is not enough scientific knowledge or capabilities in relation to the potential damage that could be caused to the environment. Central to this principle is the element of anticipation reflecting the requirement that effective environmental measures need to be based upon actions which take a long term approach and which might anticipate changes on the basis of scientific knowledge.
- **The Ecosystem approach:** It is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable, equitable use. It is based on the application of appropriate scientific methodologies, which encompasses the essential structures, processes, functions and interactions among organisms and their environment. It further recognizes that human kind with their cultural diversity is an integral component of the many ecosystems.
- **The Polluter pays principle:** This principle is based on the recognition that is important for the environmental costs of economic activities, including the cost of preventing potential harm to be internalized rather than imposed upon society at large. Consequently, it ensures that companies pay the cost of controlling pollution without being subsidized by the State. This principle is enshrined in Principle 16 of the Rio Declaration of 1992.
- **Cross-sectoral integration:** Cross- sectoral co-operation and integration are essential to comprehensively address environmental, economic and social concerns. This approach ensures that there is broad participation in complex issues by using the competencies from all sectors to solve integrated problems.
- **Regional and international co-operation:** Information sharing across sectors nationally is equally important as sharing resources and information on the regional and international platform. Almost all environmental issues transcend borders and consequently have to be approached on that basis.

The various guiding principles outlined above can be used in the national strategy and the mode of implementation can be decided at a national stakeholders' forum. However it is important to note that since the issue of ballast water touches on various sectors, it is important that cross-sectoral integration is combined with the guiding principle(s) adopted at the forum. Equally important is the need to adopt a strong regional and international approach to this issue. Regionally, the sharing of resources across regional and international co-operation within the framework of the Guinea Current Large Marine Ecosystem (GCLME) will help in the management of cross border IAS issues. Currently, GCLME is represented on the national task force (NTF) for ballast water issues. Through the GloBallast programme, the IMO organized workshops for Ballast Water Control and Management for the GCLME countries in Ghana (31 March-3 April, 2009) and Abidjan (6-8 July, 2009) to encourage countries to undertake biological surveys at sea ports and environs for potentially harmful non-indigenous aquatic species. A regional task force (RTF) has been established with Terms of Reference (TOR) to help in the discharge of its activities within the region.

The RTF will work closely with the NTF to ensure dissemination of information and regional collaboration to address trans-boundary marine environmental threats.

5.0 Objectives

5.1 What is the Strategy seeking to achieve?

The strategy seeks to manage, minimize or avoid the risk of species introduction through ballast water by adopting a supportive environmental policy based on sound scientific and technical baseline information. This can be achieved through a comprehensive national regulatory framework in line with relevant policies, legislation and institutional arrangements. Accordingly effective and efficient ballast water management practices consistent with national and international requirements will be crucial in achieving the intended outcomes.

5.2 What is the desired outcome?

The desired outcome of the strategy is to ensure that the marine environment and the ecosystem as a whole do not suffer any adverse effects of IAS from ballast water management through sound environmental practices and national, regional and international co-operation.

5.2.1 Institutional Targets

Institutional targets include the following:

Ministry of Transport

The Ministry of Transport has oversight responsibility over GMA and GPHA for the shipping industry. GMA is the National Focal Point for ballast water management and is further mandated to ratify maritime related conventions. As a first step, it is envisaged that it would ratify the BWM Convention and liaise with the Attorney-General's Department for the swift enactment of same into national legislation.

Under this strategy, GPHA as the regulatory agency of the seaports would ensure that there are adequate mechanisms for ballast water operations and the provision of requisite facilities for ballast water and sediment reception at the ports.

Ministry of Environment Science, Technology & Innovation (MESTI)

MESTI is the national focal point for biodiversity in Ghana under the Convention on Biological Diversity to which Ghana is a State Party. Biodiversity includes the marine biodiversity and consequently the role of MESTI cannot be underplayed.

Environmental Protection Agency (EPA)

The EPA is the leading governmental agency responsible for the protection and improvement of the Ghanaian environment. In accordance with its mandate as described in the Rapid Status Assessment (Clause 4.3.3), it is envisaged that the EPA will play a key role in ballast water management. It will play a role in the implementation of the marine biodiversity policy to be formulated by MESTI and collaborate with the GMA and other relevant bodies involved in ballast water management. EPA would also be involved in aspects of research, monitoring and evaluation.

Fisheries Scientific Survey Division (FSSD)

As one of the five operational divisions of the Fisheries Commission which is itself the secretariat to the Directorate of Fisheries, FSSD undertakes monitoring and research activity in the marine environment including the adverse effects of pollution to the marine ecosystem with special regard to the fisheries resource of the country. In addition, the Fisheries Commission is mandated to receive information regarding activities likely to have substantial impact on the Ghanaian fisheries resources within the marine environment. In this vein therefore, FSSD (a member of the NTF) would be primarily responsible for collating and reporting on their research activity in determining whether IAS from ballast water has adversely affected the marine fisheries resources.

Ghana National Petroleum Company

In line with its mandate, GNPC has the responsibility of ensuring that petroleum operations are conducted in such a manner as to prevent adverse effects on the environment, resources and people of Ghana. To ensure that petroleum operations do not damage the marine environment through ballast water uptake and similar activity, GNPC as a relevant stakeholder would be required to liaise with the NTF especially in alerting it of potential introduction of IAS into the marine environment through its operations whilst ensuring compliance with its relevant environmental impact assessment certificates with the EPA.

Guinea Current Large Marine Ecosystem (GCLME)

The GCLME Project is an ecosystem based effort to assist countries adjacent to the Gulf of Guinea current ecosystem to achieve environmental and resource sustainability. The GCLME is a member of the NTF on ballast water management. Regionally, it coordinates with the IMO on the implementation of the programs of the Globallast Project for all GCLME countries of which Ghana is a member. Currently its headquarters is situated in Ghana.

Department of Marine and Fisheries Science of the University of Ghana

It is envisaged that the Department of Marine and Fisheries Sciences of the University of Ghana will be one of the key agencies to make available to the GMA, EPA, GPHA amongst others on an ongoing basis available data on Ghana's oceanography based on its research activities. GPHA and the Department should regularly undertake such joint surveys to ensure early detection of any adverse ballast water impact on the marine ecosystem.

Water Research Institute (WRI) and the Water Resources Commission (WRC)

Whilst both the WRI and the WRC are not directly involved with the marine environment, their relevance to ballast water management arises when the impact of ballast water and IAS spills over into Ghana's riparian resources. Experience in other countries has shown that river bodies and other inland water ways have been adversely affected by IAS through ballast water activity. Therefore WRI and WRC whilst collating, storing and disseminating data and information on water resources in Ghana, should ensure that they collaborate and co-operate with GMA, EPA, GPHA and all relevant stakeholders for issues in relation to IAS on inland waters from ship related sources.

District Assemblies

The District Assemblies, especially those adjacent to the coast will be the connecting node between the public and ballast water management stakeholders. In this regard, the public should be educated through the district assemblies on IAS detection and the reporting procedure at the District Assembly offices. The District Assemblies should in turn liaise with the relevant stakeholders and forward information and reports on IAS through ballast water activities to them.

5.2.2 Environmental Targets

Ghana is a coastal state with many rivers, lakes, lagoons and mangroves. Also notable is the fact that Ghana has two sea ports, the Tema and Takoradi Ports. The expected expansion of oil exploitation activities in Ghana's offshore environment would have some environmental consequences associated with ballast water exchange.

The environmental targets include the marine environment in and around the ports that receives ballast water discharged from ships as well as all water bodies which could potentially be invaded by marine invasive species.

Case studies have revealed that adverse impacts of IAS can occur on infrastructure such as hydroelectric power plants as in the case of Brazil. In this regard, infrastructural targets should also be borne in mind. In Ghana, possible targets would include the Akosombo Hydro Electric Dam as well as other infrastructure that could be potentially affected by IAS through ballast water as a vector.

5.2.3 Social or economic targets

The environment has been defined in the National Environmental Policy as *“comprising the whole set of natural or biophysical and man-made or socio-cultural systems in which man and other organisms live, work and interact.*

The socio-economic targets in line with this strategy must be in consonance with the National Environmental Policy. In this regard, the socio-economic target includes people who may be directly affected socially and economically by the adverse impact of ballast water. Most of such people are those who inhabit and/or work in and around coastal areas or live and/or work in close proximity to water bodies that can be adversely affected by ballast water related issues. Major targets would be artisanal fisheries and the fishing industry, port related activity, and tourism.

The social and economic targets also include the surroundings, living conditions, economic activity and quality of life of such people, both present and future by ensuring reconciliation between economic development and natural resource conservation. The state of a high quality environment is a key element in supporting the economic and social development of citizenry who are affected by ballast water related issues. The degradation of the marine environment and affected water bodies can have adverse effects on the country as an unattractive location for the growth of industries of the future, high quality food production and tourism amongst others. This in turn will adversely affect the prosperity of future generations.

This strategy will target that group of people by placing more emphasis on coastal inhabitants and those living close to water bodies that could be affected by harmful aquatic organisms which originate from ballast water. Further, emphasis will be placed on their education and dissemination of information to adequately equip them for IAS detection and reporting.

MESTI is in charge of environmental policy formulation but currently there is no specific policy for the marine environment. Under this strategy it is envisaged that MESTI in collaboration with the NTF should actively pursue and formulate a marine biodiversity policy and further take steps to enact the provisions of the Convention on Biological Diversity into domestic legislation. Currently the Government of Ghana has developed an environmental education strategy which is to be implemented by the EPA. A marine IAS component should be incorporated in this environmental education strategy.

Strategic Priority 1: Education of the Public on IAS detection and reporting procedures.

Strategic Priority 2 : MESTI to take steps to formulate a policy on marine biodiversity and draft enabling domestic legislation on biological diversity.

6.0 Invasive Alien Species

6.1 Study on the magnitude of ballast water as an IAS vector

GPHA commissioned the Department of Marine and Fisheries Sciences of the University of Ghana to conduct a port biological baseline survey at the Port of Tema in 2010 to obtain marine biological baseline data for the port basin and its environs to determine the adverse effects, if any of BWM activities in the port waters and its environs. A similar study has been recommended for the port of Takoradi.

Strategic Priority 3: Subsequent periodic port biological baseline surveys should be conducted within Ghana's two sea ports to document and update on all native, alien and cryptogenic species that are found within Ghana's marine and coastal environment by the Department of Marine and Fisheries Sciences of the University of Ghana.

6.1.1 Integration of ballast water management into broader IAS management and coastal management process

The management and conservation status of the coastal zone of Ghana is low especially in terms of planning, co-ordination and monitoring. The coastal zone management action plan of Ghana seeks to address issues concerning coastal resources and biological diversity. The Integrated Coastal Zone Management (ICZM) Strategy is what ensures that coastal ecosystem and resources are protected, developed and managed in a sustainable manner. It is important to note however that this ICZM does not make reference to the impact of port and ship related activities such as the discharge of ballast water and introduction of IAS into the marine environment although these can have serious consequences on the State's coastal resources.

Strategic Priority 4: Incorporation of marine IAS management and BWM into Ghana's ICZM plan.

6.2 Ghana's International Obligations

Ghana's international obligations as a State in relation to conventions can only be triggered where these conventions have been acceded to or ratified by Ghana and have further been translated into domestic legislation.

As stated earlier Ghana is yet to ratify the Ballast Water Convention and until this is done Ghana cannot derive any benefits from the Convention nor be bound by any obligations in relation thereto. Due to the anticipated increase in the number of ship calls to the port and the likelihood of ship ballast exchange operations, Ghana must take steps to ratify same.

Convention on Biodiversity also remains to be translated into domestic legislation. Due to the lack of a specific legislation that translates the provisions of the convention into an applicable statute in Ghana, the country is not bound by international obligations that arise under this convention.

6.3 Responsible Agency or Department

The Ghana Maritime Authority which is mandated by section 2(j) of the Ghana Maritime Authority Act, 2002 (Act 630) *to pursue the ratification or accession to and implementation of international maritime conventions in conjunction with the appropriate ministry* must take steps to ratify the Ballast Water Convention. The procedural steps for ratification must be in conjunction with the Ministry of Foreign Affairs and the Attorney-General's Department.

Strategic Priority 5: GMA to conclude steps in ratifying the BWM Convention and draft enabling domestic legislation.

6.3.1 Division of Labour

IAS management principles are outlined in Ghana's national biodiversity strategy and national IAS strategy and action plan. However it is apparent has placed more emphasis on terrestrial IAS management with little attention paid to marine IAS. It must be pointed out however that IAS management has been a multi institutional and multi-disciplinary effort. Some agencies have been established by legislative enactments with mandates that have a relevant bearing on biodiversity conservation and management. These include the following:

- Environmental Protection Agency
- Wildlife Division of the Forestry Commission
- Water Research Institute
- Department of Marine and Fisheries Sciences of the University of Ghana.

The various roles of the relevant stakeholders to address the issue of IAS and ballast water management have been spelt out in Table 1.({

Strategic Priority 6: Broad based inter sectoral and inter agency collaboration to manage ballast water related activities in order to prevent and reduce the risk of IAS introduction in the Ghana marine ecosystem. Further to ensure harmonized activities of these agencies within the various sectors to ensure effective approach to prevention and reduction of risks of IAS introduction..

6.3.2 New legislation and the requirements to implement

BWM Convention

The BWM Convention is yet to be ratified by Ghana. As a dualist state, it is only when this Convention has been ratified that its provisions can be translated into domestic Ghanaian legislation with the force of law. The procedure for ratification requires prior approval by Cabinet and Parliament. Subsequently the Ministry of Foreign Affairs drafts an instrument of ratification which is signed by the President and deposited at the relevant international organization which is the IMO. Upon ratification, the Attorney-General's Department of the Ministry of Justice (or any other body or entity appointed to draft the bill) is tasked to draft the bill based on the relevant provisions of the convention. The bill is laid before the relevant select committee which for the purposes of ballast water management will be the select committee on transport. After review by the select committee, the bill is debated on the floor of parliament and then passed into legislation after receiving presidential assent. It should be noted that prior to presentation to cabinet for approval to ratify this convention there should be ongoing stakeholder consultations and up to and through the stages of drafting the bill.

Draft Bill on BWM

Currently there is a draft bill which will be presented to parliament in due course. The draft bill which is regulatory in substance seeks to address the issue of ballast water management in Ghana. As stated in the Rapid Status Assessment, there is currently no regime in Ghana that regulates ballast water activity.

The bill is based on the provisions of the BWM Convention which replaced IMO Resolution 868/20. This bill creates a new regime which seeks to regulate ballast water activity as a way of preventing IAS through ballast water. It lays down comprehensive enforcement provisions for both Ghanaian flagged vessels and foreign flagged vessels through port state control. The bill also lays down an adequate penal regime for contravening the provisions of the Convention.

The draft bill obliges ships operating under the Ghanaian flag or other flag which is party to the BWM Convention to carry onboard a BWM Plan and Ballast Water Record Book which complies with the BWM Convention. The bill also obliges vessels to conduct ballast water exchange in accordance with the standards prescribed therein as laid down in the BWM Convention. Under the provisions of the draft bill, appropriate authorities are mandated to carry out a ballast water management survey on Ghanaian flagged vessels and issue the appropriate BWM certificate.

The draft bill also makes it imperative for ships' officers and crew to be familiar with their duties in the implementation of ballast water management particular to the ship on which they serve.

It is noteworthy that this draft bill enjoins GPHA or terminal operator to provide adequate facilities for the reception of sediments and repair of ballast tanks. In this regard, the draft bill provides a format to report the inadequacy of reception facilities.

As a State Party to the BWM Convention, the draft bill ensures that Ghana through the GMA is required to notify the IMO on specific measures in addition to those laid down in the national BWM Plan, Record Book and Certificate which it considers necessary to prevent, reduce or eliminate the transfer of harmful aquatic substances and pathogens including IAS. The provisions of the draft bill also enjoin Ghana to notify the IMO and mariners of areas in Ghanaian waters where ballast water should not be taken by ships due to the known presence of harmful aquatic organisms and pathogens.

In relation to this bill, it should be noted that the strategy adopts the provisions of the convention as a whole because there is an absence of any domestic legislation which regulates ballast water operations.

6.4 Evaluation and Monitoring of Ports

There is currently no entity that evaluates and monitors the sea ports for IAS. An agency or multi-sectoral agency must be identified to monitor and evaluate the ports for IAS introduction into the sea ports ecosystem from ballast water.

The Department of Marine and Fisheries Sciences of the University of Ghana has been commissioned by GPHA and is currently carrying out a biological port baseline survey on a regular basis to ascertain the marine eco-system and biodiversity and to determine if it has been affected by IAS through ballast water activities.

This largely addresses the need to determine the harmful effects if any that ballast water activity has on the marine eco-system. The ongoing port baseline surveys ensure regular monitoring of the port basin and its environs.

7.0 Ballast Water Management

There is currently no legal, regulatory or operational regime in Ghana regarding Ballast Water Management. Vessels calling at the sea ports of Ghana are not subject to ballast water management requirements. As stated earlier this strategy envisages the urgent ratification of the BWM Convention by Ghana through the GMA and subsequent enactment into domestic legislation. (See 6.3.2 above).

7.1 Agency or Department that is responsible

There is currently no agency or department that is responsible for ballast water management. It is necessary that a lead agency is identified to be responsible for matters relating to ballast water management in collaboration with other relevant agencies. See the role of the lead agency in 8.1.2 below.

7.1.1 Division of Labour

Due to the lack of any agency responsible for ballast water management, there is also no organized structure that adequately apportions various tasks to assigned persons or bodies. GMA is the lead agency and as such its role and functions have been spelt out in the draft bill on ballast water management to regulate all related issues in collaboration with the relevant agencies. The various roles of the stakeholders or key players have been assigned in Table 1.

7.2 Ballast Water Management Plan

Currently, there is no approved ballast water management plan in Ghana. The draft bill has adopted the ballast water management plan as annexed in the BWM Convention as a way of addressing this absence.

7.2.1 BWM Certificate

Currently Ghana has no identifiable BWM Certificate. Again the draft bill has adopted the BWM Certificate contained in the Annex to the BWM Convention. This document certifies that a Ghanaian flagged vessel (or a requesting foreign flagged vessel who is party to the BWM Convention) has successfully completed a survey endorsing that its on-board ballast water treatment can adequately prevent the introduction of IAS or other harmful aquatic organisms. The national legislation on ballast water management should formulate a certificate issued by the relevant agency.

7.2.3 BWM Record Book

Ghana has not formulated any BWM Record Book for ships flying its flag. The draft bill has also adopted the BWM Record Book as is contained in the BWM Convention to address this lack. When the draft bill is enacted the BWM Record Book for Ghanaian flagged and foreign vessels who are parties to the BWM Convention would be a statutory requirement.

7.2.4 Ensuring Compliance among ships flying the country's flag

There is currently no legal regime for ballast water management activities by vessels in Ghanaian waters and consequently there is no regime to ensure compliance of such vessels. The draft bill applies to all Ghanaian flagged vessels of 400gross tonnage and above. Such vessels are statutorily required to subject themselves to a survey and upon successful completion would be endorsed by a certificate. The provisions of the draft bill also ensure that Ghanaian flagged vessels apply the standards and requirements laid down in the BWM Convention.

To ensure ongoing compliance, when GMA or a nominated surveyor determines that the ship's ballast water does not conform to the particulars of the certificate which renders it a threat of harm to the environment, human health, property or resources, it instructs the vessel to carry out corrective action and may withdraw the certificate until the corrective action has been undertaken.

Further, defects which substantially affect the ability of the ship to conduct ballast water management in accordance with what the Act prescribes should be reported by the owner, operator or other person in charge of the ship. The draft bill should also lay down a penal regime to sanction all offenders who contravene the provisions of the law that would be enacted.

7.2.5 Inspection of Ships

Ghana does not carry out any inspection of ships to ascertain their compliance with BWM . As the draft bill empowers the GMA to carry out ballast water management inspections both on Ghanaian flagged vessels and foreign flagged vessels under port state control, it is suggested that this activity needs to be commenced.

7.2.6 Enforcement and Penalties

Due to the absence of any legal and/or regulatory framework on ballast water management, it follows that there is also no enforcement and penalties mechanism for ballast water management. Again, the draft bill lays down a penal regime for offences and acts contravening the provisions of the Act up to a maximum of 16,000 penalty units. In Ghana, a penalty unit is equivalent to GHC12.00.

Strategic Priority 7: Draft bill on BWM should be incorporated in existing institutional legal frameworks including prescribed BWM Plans, record books, approved vessel systems and national certificates. Train build and maintain capacity of relevant personnel for BWM through regular training and capacity building through organizing Compliance, Monitoring and Enforcement workshops.

8.0 Implementation Plan

In order to arrive at the desired level of enacting national legislation, there is the need to develop an implementation plan which will determine all the legislative requirements for the implementation of the strategy.

Strategic Priority 8: Formulate an implementation Plan of the Strategy with realistic timeframes on various actions to be carried out.

8.1 Institutional Arrangements

As earlier noted, the issue of ballast water management is necessarily a multi-faceted approach involving inter-sectoral agencies and institutions. These would include the following:

- Ghana Maritime Authority
- Ghana Ports & Harbours Authority
- Environmental Protection Agency
- Academic Institutions (Department of Marine and Fisheries Sciences of University of Ghana.
- Research Institutions
- Guinea Current Large Marine Ecosystem
- Marine Fisheries Research Division of the Ministry of Food & Agriculture.

The various institutions mentioned above are represented on a national task force on ballast water management and their role is spelt out in the Table 2.

8.1.1 Regional or National responsibilities

The country should assume its responsibilities on both the national and regional front emanating from conventions, treaties and arrangements by ratifying all relevant conventions on IAS and ballast water management through the relevant agencies. Further, these conventions should be enacted into domestic legislation and there should be the establishment of port ballast water management programmes.

8.1.2 Lead Agency

It is important that a lead agency is identified for the implementation plan. The lead agency will spearhead the process of implementation by bringing together all the key agencies and utilizing their combined expertise in the implementation process. The lead agency will be responsible for the development and implementation of the necessary country level information, education and participation of activities that are key to the success of the strategy.

It is evident from recent activity relating to ballast water management that the GMA has adopted that role. It is pertinent to note also that EPA is the lead agency under the National Strategy on IAS, policy guidelines and action plan for Ghana. It is noteworthy that the national strategy on IAS in Ghana has been largely directed to terrestrial and inland water bodies with little reference to the marine ecosystem. In view of the specialized nature of issues relating to ballast water and the international dimensions including trade and shipping, it is envisaged that GMA would play its lead role in close collaboration and partnership with the EPA for IAS of the marine ecosystem.

Strategic Priority 9: Assumption of the Lead Agency Role by GMA in BWM related activities whilst collaborating closely with the EPA who is the lead agency in activities related IAS Strategy, policy guidelines and action plan for Ghana.

8.1.3 Advisory Groups or Task Force

There is currently a national task force (NTF) on ballast water management. It comprises representatives of all key players whose role is crucial to the strategy. The representation of the NTF currently includes the following:

- GMA
- EPA
- Department of Marine and Fisheries Sciences of the University of Ghana
- GPHA
- Ghana Atomic Energy Commission
- Ghana Navy
- Marine Fisheries Research Division of the Ministry of Agriculture
- WRI of CSIR
- Regional Maritime University
- GCLME
- Ghana Standards Board
- Relevant MMDAs
- Marine Police
- Ghana Inshore Fishermen Association

It has been noted that the National Development Planning Commission (NDPC) is not currently represented on the NTF and it is recommended that NDPC should be adequately represented.

Strategic Priority 10: The responsibilities of the NTF as spelt out in the GloBallast Guidelines for National Task Force must be adhered to by the effective coordination of the NTF coordinator. A representative of the National Development Planning Commission should be included in the NTF to ensure harmonized activities between BWM related activities and the overall national development planning.

8.1.4 Cross-sectoral Collaboration

The lead agency alone cannot effectively address the ballast water management and IAS issue and therefore there is the need for an effective cross-sectoral approach amongst the NTF and other relevant stakeholders

This strategy identifies the following key areas for cross-sectoral collaboration as indicated in the Table 1 below:

Table 1.

	ACTION POINTS	SPECIFIC ACTIVITIES	RESOURCE ORGANISATION
1	Policy formulation	Stakeholder engagement <ul style="list-style-type: none"> – Public workshop and discussion – Stakeholders consultation – Formulation of draft policy 	Under auspices of MESTI in collaboration with NDPC, EPA, GMA, Public, GPHA, Ministry of Transport

2	Ratification of BWM Convention	<ul style="list-style-type: none"> – Depositing of instrument of Ratification at IMO. – Drafting of bill in relation to BWM Convention. – Review of Bill by Parliamentary Select Committee on Transport. – Debate on floor of Parliament. – Passage of bill into law. – Presidential Assent. – BWM Plan, Record Book, Certificate. 	GMA, Ministry of Justice, Ministry of Foreign Affairs and Parliament of the Republic of Ghana
3	Research, Monitoring and Evaluation	<ul style="list-style-type: none"> – Water and sediment quality and biological assessment of port areas and Ghana’s coastal waters and inland waters. – Taxonomic evaluation and inventory of marine organisms in port basins and their environs to ascertain presence of cryptogenic and invasive marine organisms. – Continuous monitoring to update database and detect IAS. 	Dept. of Marine and Fisheries Sciences of University of Ghana, EPA, MFRD, RMU, GPHA, WRI of CSIR,
4	Education and Dissemination		District, Municipal and Metropolitan Assemblies; Academic Institutions; General Public

8.2 Information Gathering

8.2.1 Risk Assessment Survey and Monitoring

Risk Assessment is a crucial starting point for the management of transferred and introduced harmful aquatic organisms and pathogens in ship’s ballast water. As a port state, Ghana may wish to apply its ballast water management regime uniformly to all vessels that call at its ports and to assess the relative risk of these vessels to its coastal marine resources. This uniform approach, in other words known as the blanket approach will offer Ghana a more simplified administration. If applied strictly, the uniform approach will offer the state greater protection from unanticipated bio-invasaders, as it does not depend on the reliability of a decision support system that may not be complete. This approach requires substantial monitoring of vessels as well as crew education to ensure all foreign and domestic flagged ships are complying with the required ballast water management action in place.

An alternative to the blanket approach may be the selective approach method which uses selective ballast water management regimes, based on voyage-specific risk assessments. This approach may however place commensurate information technology and management burdens on the State. Its effectiveness may also depend on the quality of information and database system that supports it.

Before Ghana decides to either adopt the blanket or selective approach in the management of ballast water being discharged into its waters, there is the need to carry out risk assessment for each port under consideration. The ballast water risk assessments can be in the form of: Qualitative Risk Assessment; Semi-Quantitative Ranking of Risk; and Quantitative Risk Assessment

The qualitative Risk Identification being the simplest approach is based on subjective parameters drawn from any previous experience, established principles and relationships and expert opinion, resulting in simple allocations of 'low', 'medium' and high risks. It is important to note however, that, because the approach is subjective, we may stand the risk of overestimating low/high consequence events and underestimating high/lower consequence events.

The semi-quantitative approach uses quantitative data and ranking of proportional results wherever possible. This helps to increase objectivity and minimize the need for subjective opinions.

The third approach, which is the quantitative approach, has been found by experts to be the most comprehensive approach because it aims to achieve a full probabilistic analysis of the risk of ballast water introductions, including measures of confidence. It requires significant collation and analysis of physico-chemical, biological and voyage specific data, including key lifecycle and tolerance data for every pre-designated species of risk (target species), port environmental conditions, ships/voyages characteristics, the ballast water management measures applied, and the input and evaluation of all uncertainties. This approach requires a high level of resourcing, computer networking and sophisticated techniques.

Strategic Priority 11: NTF tasked with identifying the most effective approach to risk assessment survey and monitoring.

8.2.2 Research and Development of Ballast Water Management Schemes

Research and development of BWM schemes can be carried out through collaboration between relevant stakeholders. In Ghana, the major stakeholders in the maritime industry are the Ghana Ports and Harbours Authority (GPHA) and the Ghana Maritime Authority (GMA). It is the duty of these major stakeholders to initiate projects that are geared towards the development of ballast water management against the introduction of any harmful aquatic organisms in Ghana's waters. Other relevant institutions with key interest in marine environmental protection such as the Department of Marine and Fisheries Sciences of the University of Ghana, the EPA, the Ghana Wildlife Department, the FSSD and the Ministry of Environment can support the GMA and GPHA through scientific research to aid in the development and implementation of BWM schemes and policies.

8.2.3 Monitoring of National Strategy Implementation

Effective and strict legislative and enforcement measures are very crucial in the monitoring of any BWM strategy. Specially trained personnel can be employed at the sea ports to ensure that all vessels that call the ports are complying strictly with the BWM measures that have been adopted by the State. These personnel are to monitor the quality of ballast water being discharged by vessels and ensure that all ballast water record books on board vessels are adequately checked.

8.2.4 Evaluation and Review of Strategy

Evaluation and review of the **BWM** strategy can be carried out by expert opinion. It is the core duty of the major stakeholders in the maritime industry to form an evaluation and review board comprising experts from all the relevant stakeholder institutions to meet periodically to evaluate and review all existing strategies and suggest new ones to augment previous strategies. Opinions can also be sought from the IMO when needed.

Strategic Priority 12: Periodic Review of Strategy through the establishment of an evaluation and review board to review this and other related strategies to ensure that the strategy remains relevant to changing issues, surveys, technology.

8.3 Cross-jurisdictional Coordination

There is currently no cross jurisdictional co-ordination in relation to ballast water management. Regional co-operation through the GloBallast regional strategies should be adopted. The NTF should be involved in regional task forces to ensure effective co-ordination. This will ensure harmonization of programmes through the exchange of experiences and information sharing. As earlier stated in 3.1.2 algal bloom has been reported in rivers and wetlands of the Amanzule at Bakanta and Ankobra at Sanwoma respectively which is believed to originate from an organic nutrient-rich Ivorian lagoon, most likely the Abidjan lagoon. These blooms are dislodged and washed into the marine environment during the major rains in April-June and September-October/November. The easterly movements of the Gulf of Guinea ocean currents then drive the algal bloom into Ghanaian waters.

The Strategy envisages that the NTF would take immediate measures to initiate a fact finding mission to Cote D'Ivoire to ascertain the sources of the algal blooms and initiate cooperation between the two countries to find solutions to this problem.

Strategic Priority 13: Promote Regional Cooperation and ensure that national strategy is harmonized with the Regional Strategic Action Plan through GCLME/IGCC/RCU as the Regional Implementation Partner.

8.4 Communication, Awareness Raising and Training.

There is the need to place a high priority on raising awareness about the problem of harmful aquatic organisms transported in ships' ballast water. Awareness raising products from the relevant institutions must be made available to all stakeholders, especially the shipping companies. Posters brochures and leaflets on harmful aquatic organisms transported by ships' ballast could be left on board vessels upon arrival or departure from Ghana's seaports. For example the appropriate authorities can adopt the GloBallast Partnership's document "Stopping the Ballast Water Stowaways" and leave copies on board vessels coming to Ghanaian ports.

The Regional Maritime University could be asked to include the subject in the curriculum for sea training to make seamen and officers trained locally aware of the problem and how to manage it.

8.4.1 National Governmental Agencies

- Ghana Ports & Harbours Authority (GPHA);

- Ghana Maritime Authority (GMA);
- Environmental Protection Agency (EPA).
- Ministry of Transport; (MOT)
- Ministry of Environment, Science & Technology. (MESTI)
- Academic Institutions
- Marine Fisheries Research Division of the Ministry of Food & Agriculture

8.4.2 Industry

- Shipowners & Agents Association of Ghana (SOAAG);
- Ghana Merchant Navy Officers Association (GMNOA);
- Tema Oil Refinery (TOR);
- Ghana National Petroleum Company (GNPC);
- Ghana Cement Company (GHACEM);
- Ghana Manganese Company;
- Ghana Bauxite Company;

8.4.3 International Conventions

The relevant international conventions to be included in any awareness programme are;

- BWM Convention
- Convention on Biological Diversity
- United Nations Convention on the Law of the Sea (UNCLOS)
- UNEP Regional Seas Convention

8.4.4 Fostering International links and co-operation

As the issue of ballast water management has not been addressed at country level there is very little, if at all any international links and co-operation. The NTF can effectively institute such international links and co-operation through the lead agency.

9.0 Funding

9.1 Implementation Funding (Initial 2 – 5 years)

There is currently no funding for any ballast water management. It is recommended that funding for the implementation of ballast water management strategy should be provided by multi-donor sources including the following:

- GloBallast Partnership
- UNDP
- African Development Bank
- UNEP

Strategic Priority 14: Funding from the local component may be sourced from the Government of Ghana through the Ministry of Transport (GMA, GPHA, GSA) and MESTI as well as the Biodiversity Trust Fund to be set up under the National Biodiversity Strategy..

9.1.1 Staffing

In order to ensure the uninterrupted flow of activities relating to the implementation of the strategy, it is strongly recommended that the staff are as much as possible autonomous in carrying out their functions.

In this regard, a core staff unit should be employed by the GMA (as lead agency. However funding for staffing should be borne by the fund into which multi source donors (both local and international) will contribute. The core staff would be dedicated solely to the implementation of the ballast water management strategy and related issues.

As a core unit, the technical staff would comprise the following:

- Marine Biologist
- Socio-economist
- Legal officer.

The Administrative staff would comprise two (2) personnel officers in charge of the project secretariat.

9.1.2 Gathering Information, Inspections, studies

All BWM strategy and related issues including information gathering, dissemination of information and education should be carried out by the core staff. To ensure that information gathering, inspections and studies are carried out effectively, the core staff should liaise with all relevant agencies.

Strategic Priority 15: Employ key staff to be seconded to the GMA to handle all BWM related issues.

9.1.3 Supporting costs (communication, training, monitoring and evaluating)

This should be borne by the fund into which multi donor sources of funding (local and international) would be contributed.

9.2 On-going Funding

9.2.1 Staffing

The staffing for ballast water related issues during the implementation period of the strategy should continue in that capacity beyond the implementation period. Further, the unit may be expanded to build and strengthen capacity.

9.2.2 Gathering information, inspections, studies (beyond 5 years).

This should be decided by stakeholders at the national stakeholders' forum. Sources of funding should include foreign donor agencies and locally from Government of Ghana through the Ministry of Transport (GMA, GPHA, Ghana Shippers Authority) and Ministry of Science and Technology as well as the Biodiversity Trust Fund to be set up under the National Biodiversity Strategy.

10. Stakeholders Analysis-Stakeholders Roles, Strengths, Weaknesses And Expectations

Table 2 analyses the various current roles of the stakeholders, their strengths and weaknesses and their expected roles in the light of this BWM strategy. It is pertinent to note in relation to this table that the original table was formulated under the National Invasive Species Strategy (2007) as part of the national strategy. In view of the fact that this National Ballast Water Management Strategy has a direct bearing on IAS, the table under reference has been updated to compliment rather than duplicate the institutional roles, activities and expectations as well as the strengths and weaknesses of the individual institutions. It is equally noteworthy that some of the institutions in this table have a remote role to play with BWM specifically and its attendant IAS issues. In that regard, such institutions were not mentioned as key players under this BWM strategy. The additions made to the original table in order to make it read holistically in relation IAS strategy have been highlighted in blue.

Table 2. STAKEHOLDERS ANALYSIS-STAKEHOLDERS ROLES, STRENGTHS, WEAKNESSES AND EXPECTATIONS

Stakeholders	Roles	Strengths	Weakness	Expectations
Ministry of Transport	<ul style="list-style-type: none"> • Formulate policies, programmes and plans in the areas of transport including shipping. • Has oversight responsibility for GPHA and GMA for the shipping and general maritime industry. 	<ul style="list-style-type: none"> • Has the capacity and mandate to institute arrangements for enhanced collaboration with other organizations in the maritime sector. 	<ul style="list-style-type: none"> • Lacks adequate capacity (human financial and logistic) to coordinate the prevention, monitoring and management of threats of ballast water operations and IAS. 	<ul style="list-style-type: none"> • Enhanced capacity to coordinate the prevention and management of ballast water management and IAS related issues.
GPHA	<ul style="list-style-type: none"> • Regulator of the sea ports of Ghana. Has regulatory functions over all port related operations. 	<ul style="list-style-type: none"> • Has the capacity and mandate to institute arrangements and regulations over shipping activity in the sea ports. 	<ul style="list-style-type: none"> • Lacks the capacity (infrastructural, human and financial) to offer reception facilities for ships calling at the sea ports to carry out ballast water operations. 	Enhanced capacity (infrastructural, human and financial) to offer reception facilities for ships to carry out ballast water operations.

Stakeholders	Roles	Strengths	Weakness	Expectations
GMA	<ul style="list-style-type: none"> • Has the mandate to ensure the ratification of maritime conventions for and on behalf of Ghana. • Liaises and coordinates activities of maritime stakeholders. 	<ul style="list-style-type: none"> • Hosts the focal point for BWM related issues. • Has the mandate and capacity to liaise and coordinate the activities of the various stakeholders in the maritime sector and has the capacity to institute arrangements with stakeholders for enhanced collaboration with such stakeholders for marine environmental issues. 	<ul style="list-style-type: none"> • Lacks the technical expertise to deal with BWM related issues. 	<ul style="list-style-type: none"> • Improvement in capacity building through employment of adequate technical expertise. • Enhanced capacity to coordinate issues relating to BWM.

Stakeholders	Roles	Strengths	Weakness	Expectations
GCLME	<ul style="list-style-type: none"> Offers assistance to countries adjacent to the Guinea current ecosystem to achieve environmental and resource sustainability. 	<ul style="list-style-type: none"> Has the technical expertise to offer the needed assistance to GCLME member countries from a regional perspective. 	<ul style="list-style-type: none"> Inadequate logistics of member countries. 	<ul style="list-style-type: none"> Continue to play its role as a coordinating body for ballast water related issues. Ensure increased regional co-operation in matters relating to trans boundary IAS infestations.
Department of Marine and Fisheries Sciences of the University of Ghana	<ul style="list-style-type: none"> Academic institution that carries out biological and taxonomic research, gathers data and monitors Ghana's coastal waters 	<ul style="list-style-type: none"> Has requisite technical expertise for marine environmental research. 	<ul style="list-style-type: none"> Lacks logistics and funding to effectively carry out research and monitoring of the maritime delimitation zones. 	<ul style="list-style-type: none"> Carry out regular biological baseline survey of Ghana's sea ports and environs.

Stakeholders	Roles	Strengths	Weakness	Expectations
Ministry of Fisheries and Aquaculture Development	<ul style="list-style-type: none"> • Formulates all policies on Agricultural production. • Directs the PPRSD and GIDA on policies relating to IAS prevention and management. • Through the FSSD, monitors and carries out research on the marine fisheries resource. 	<ul style="list-style-type: none"> • Have some trained personnel in all the regions and districts of the country. • Have the ability to disseminate information to other farmers and other stakeholders through the extension and field staff. 	<ul style="list-style-type: none"> • Trained staff in IAS recognition and prevention is inadequate. • Lacks adequate and appropriate quarantine facilities in almost all the regions of the country. • Lacks funds for data and research activities on impact of ballast water on marine fisheries 	<ul style="list-style-type: none"> • Improvement in the existing facilities and infrastructure in IAS prevention, monitoring and management. • Liaising with Ministry of Transport and MESTI on IAS from ballast water activities and its impact on the marine fisheries resource. • Should be adequately funded
Ministry of Lands and Natural Resources	<ul style="list-style-type: none"> • Has overall responsibility for formulating land, forestry and wildlife policies. • Exercise ministerial responsibility over forestry and wildlife departments. • Monitors the implementation of policies and activities of private and public agencies engaged in forestry and wildlife resource utilization and management. 	<ul style="list-style-type: none"> • Capacity to liaise with other ministries, department and agencies to ensure land forestry utilization and management. • Acts to reduce tension and resolve disputes between government, private developers and customary owners. 	<ul style="list-style-type: none"> • Lacks adequately trained human resource and logistical and financial base. • Lacks networking facilities between ministries, departments and agencies. 	<ul style="list-style-type: none"> • Improvements in the human, financial resources and logistical base. • Effective inter and intra sectoral networking amongst the departments, agencies and landowners (traditional authority).

Stakeholders	Roles	Strengths	Weakness	Expectations
Ministry of Energy & Petroleum	<ul style="list-style-type: none"> • Formulates energy policies for the government. • Exercises ministerial responsibility over the VRA, TOR, ECG and private power producers. • Has the mandate to develop the lake resources including the fisheries and biodiversity of the Volta River System. 	<ul style="list-style-type: none"> • Have logistics through the VRA for surveillance and IAS in the Volta System. 	<ul style="list-style-type: none"> • Inadequately trained personnel in IAS recognition, monitoring and management. • Insufficient logistical and financial support for IAS management. 	<ul style="list-style-type: none"> • Existing facilities and human and financial resource base will be augmented and strengthened.
Ministry of Local Government and Rural Development	<ul style="list-style-type: none"> • Formulates implements and coordinates local government policies on decentralization. • Monitors, facilitates, supervises and evaluates the activities and programmes of all district, municipal and metropolitan assemblies. 	<ul style="list-style-type: none"> • Disseminates information at local government level. • Has some trained local council staff on the field to monitor and enforce bye-laws. 	<ul style="list-style-type: none"> • Lacks adequately trained personnel to serve as liaison officers in the decentralization process. • Insufficient information dissemination facilities for effective communication at grassroots levels. 	<ul style="list-style-type: none"> • Well trained and motivated staff to lead crusade against IAS in the district. • Public awareness Education and Information dissemination tools will be updated. • Coordinate relations between the general public and the GMA/GPHA/EPA core unit staff for BWM and IAS.

Stakeholders	Roles	Strengths	Weakness	Expectations
Ministry of Water Resources, Works & Housing	<ul style="list-style-type: none"> Formulates and coordinates all policies relating to water resources management in the country. Monitors, supervises and evaluates performances of both public and private agencies in the realization of the policy objectives of the established sectors. 	<ul style="list-style-type: none"> Has established institutions that perform specific functions in water provision and management under the Ministry. Has some qualified technocrats that supervise the implementation of policies and programmes. 	<ul style="list-style-type: none"> Lacks adequately trained staff for proper monitoring and supervision of water bodies for IAS introductions. Lacks adequately trained staff for proper monitoring and supervision of water bodies for IAS introduction through ballast water activity. Institutions are not adequately resourced to function properly with respect to monitoring and management of IAS. 	<ul style="list-style-type: none"> Adequately trained and motivated staff to monitor and supervise projects. Institution to be well resourced to meet emerging challenges posed by IAS infestations.
Plant Protection and Regulatory Services Directorate (PPRSD(MOFA))	<ul style="list-style-type: none"> Regulates the importation of plants, plant parts and pests. Confiscates prohibited species. Undertakes plant pest control countrywide. Certifies clean plants and planting materials. Monitors the use and importation of pesticides and fertilizer. 	<ul style="list-style-type: none"> Has some trained personnel in IAS management Has legal mandate to intercept and confiscate any IAS plant materials. Has knowledge in IAS management in general <p>Has some capacity to manage IAS infestations.</p>	<ul style="list-style-type: none"> Lacks adequate capacity (personnel, Logistics, finance) to spot and monitor IAS introductions in every part of the country. <p>Not all personnel can recognize foreign species importation of IAS.</p>	<ul style="list-style-type: none"> Enhancement of capacity to perform its roles through: improvement in the training of personnel, provision of logistics and networking with other local and international stakeholders

Stakeholders	Roles	Strengths	Weakness	Expectations
<p>Customs Division of the Ghana Revenue Authority (GRA)</p>	<ul style="list-style-type: none"> • Collect customs and excise duties countrywide. • Patrol all the country's borders/entry points to check smuggled goods (including IAS) into Ghana. • Mandated to do IAS inspections at some entry points. 	<ul style="list-style-type: none"> • Has personnel at all recognized entry points countrywide • Effects arrest of importers of recognized IAS. 	<ul style="list-style-type: none"> • Inadequate capacity to monitor all unrecognized entry points effectively. • Most personnel have no training in the recognition of IAS. 	<ul style="list-style-type: none"> • Enhanced capacity to effectively monitor all IAS introductions at all entry points • Train personnel in IAS recognition and take appropriate measures to prevent access of IAS to general public.
<p>CSIR-Water Research Institute (WRI)</p>	<ul style="list-style-type: none"> • Research into water resources (living and non-living. • Research and disseminate information. • Provide information and services for sustainable development, utilization and management of water resources. 	<ul style="list-style-type: none"> • Has trained personnel in water resources (ground and surface) and quality assessment and management including IAS. • Has some equipment for IAS assessment and control. 	<ul style="list-style-type: none"> • No full complement of trained personnel to cover nationwide survey for IAS management. • Its field stations are in the northern and southern half of the country. The middle belt has no stations. 	<ul style="list-style-type: none"> • Increased capacity (trained personnel, state of the art equipment and adequate finances) for aquatic IAS management countrywide. • The WRI should be adequately staffed and equipped to identify IAS infestations in inland water bodies through ballast water activities.

Stakeholders	Roles	Strengths	Weakness	Expectations
Environmental Protection Agency (EPA)	<ul style="list-style-type: none"> • Advise on policy formulation on the environment and its protection. • Implementation of policies, regulations and programs to ensure sustainable management of the environment. • Promote studies, research analyses for improved environmental protection and maintain sound ecological systems. • Ensure compliance and enforcement of environmental regulations. • Conduct and promote environmental education and awareness. 	<ul style="list-style-type: none"> • Has some trained personnel in all regional capitals in the country. • Collaborates with all Districts Environmental Committees on environmental issues. • Collaborates with major stakeholders (national and international) in the management of IAS. 	<ul style="list-style-type: none"> • Inadequate logistic support (trained personnel, finance, equipment, transport) to undertake their roles effectively. 	<ul style="list-style-type: none"> • Facilitate their roles in the formulation and implementation of policies on IAS management.
Volta River Authority (VRA)	<ul style="list-style-type: none"> • Generate electricity for domestic and industrial uses. • Provide facilities and assistance for the development of the lake resources (for fish production and transportation). • Ensure the sanctity and sustainable development of the Volta lake and its resources. 	<ul style="list-style-type: none"> • Have logistics for surveillance and management of IAS in the Volta System, • Have some capacity for integrated control of IAS. 	<ul style="list-style-type: none"> • Inadequately trained personnel in IAS management. • Limited equipment for controlling major IAS infestations in the Volta system. 	<ul style="list-style-type: none"> • Augment existing resources (human logistical support, finance and equipment.) Surveillance should also include IAS infestation introduced via marine related ballast water management activities.

Stakeholders	Roles	Strengths	Weakness	Expectations
Irrigation Development Authority (IDA)	<ul style="list-style-type: none"> Develops, operates, manages and maintains the irrigation systems for agricultural purposes 	<ul style="list-style-type: none"> Have personnel on all their facilities (dams) countrywide to be used to monitor and manage IAS. 	<ul style="list-style-type: none"> Lacks trained personnel to recognize and manage major IAS infestation. 	<ul style="list-style-type: none"> Build capacity to facilitate the recognition and management of IAS infestation.
Water Resources Commission	<ul style="list-style-type: none"> Plans, regulates and manages the development and use of freshwater resources. Promote sustainable economic growth and protection of freshwater ecosystems. 	<ul style="list-style-type: none"> Has some capacity to enforce laws on the management of IAS in water bodies. Has some capacity to assist other organizations to facilitate the education and create public awareness on IAS. 	<ul style="list-style-type: none"> Inadequately capacity for IAS management countrywide. Not adequately networked with institutions/stakeholders in aquatic IAS management. 	<ul style="list-style-type: none"> Improve capacity for aquatic IAS management. Improve network capacity and collaboration.
Industry players	<ul style="list-style-type: none"> Establish sediment reception facilities for ships. Repair, maintenance and service of ships. Ship scrapping. 	<ul style="list-style-type: none"> Expertise in repairs and maintenance, service vessels, scrapping of ships hold, pumping of ballast water tanks. 	<ul style="list-style-type: none"> Lack of sediment and reception facilities. 	<ul style="list-style-type: none"> Strengthen capacity for environmental compliance. Establish reception facilities for sediment treatment and disposal.

Stakeholders	Roles	Strengths	Weakness	Expectations
Ghana Standards Authority	<ul style="list-style-type: none"> Assessment of quality of fish exports. Sets standards and ensures compliance 	<ul style="list-style-type: none"> Adequate expertise for the assessment of water quality standards. 	<ul style="list-style-type: none"> Lack of marine scientists 	<ul style="list-style-type: none"> Facilitate compliance of standards. Employ marine scientists and collaborate with marine science institutions.
National Fisheries Association of Ghana and other Fisheries Associations.	<ul style="list-style-type: none"> Report observations of new species of marine organisms and fish. 	<ul style="list-style-type: none"> They form a very large group Always on the 'ground' and obtain first-hand information on non-native species. 	<ul style="list-style-type: none"> They need scientific orientation to report observations. 	<ul style="list-style-type: none"> Build capacity to facilitate recognition and reportage of non-native and invasive species.
Ministry of Health	<ul style="list-style-type: none"> Provide health facilities nationwide and monitor disease outbreaks amongst other functions. 	<ul style="list-style-type: none"> Have health posts and hospitals nationwide with the capacity to observe seafood poisoning from ingestion of IAS infested seafood. 	<ul style="list-style-type: none"> Lack of logistical support and specialized training to identify seafood poisoning. 	<ul style="list-style-type: none"> Build capacity to contribute to the monitoring of diseased organisms (pathogens), Train medical personnel to identify such medical conditions for quick diagnosis and report outbreaks to appropriate agencies

Stakeholders	Roles	Strengths	Weakness	Expectations
<p>Ship Owners & Agents Association of Ghana (SOOAG)</p>	<ul style="list-style-type: none"> • Association of ship-owners and their agents established in Ghana to further the objectives of vessel owners and act as a common platform for advocacy of shipping. 	<ul style="list-style-type: none"> • Vessel owners with interest in ensuring compliance with BWM guidelines and Convention 	<ul style="list-style-type: none"> • Currently unclear which have ballast water treatment facilities on board vessels. 	<ul style="list-style-type: none"> • Ship-owners and their operators should be fully compliant by 2016 in accordance with BWM Convention.

ACTION PLAN IMPLEMENTATION TABLE

Action Points	Activities	Year							
		2009	2010	2011	2012	2013	2014	2015	
Action 1 Establishment of National Task Force	<ul style="list-style-type: none"> Organize an expanded meeting for establishment of task force Adopt the terms of reference document for the National task force Adopt the National Strategy document Plan Future Activities 	√				draft approved by NTF	Endorsed by relevant stakeholders	✓	
Action 2 Ratify the International Convention for the Control and Management of Ship's Ballast Water and Sediments (BWM Convention) through GMA's role	<ul style="list-style-type: none"> GMA to step up efforts towards the ratification process as soon as possible 					Memo on ratification of draft bill submitted to cabinet	Expected ratification of BWM Convention		

Action Points	Activities	Year						
		2009	2010	2011	2012	2013	2014	2015
Action 3 Conduct awareness raising activities	<ul style="list-style-type: none"> Organise a ballast water management Workshops Prepare booklets , brochures, posters for circulation to public Set-up a national web page on ballast water management systems Show the BBC documentary film “ invaders of the sea” to the public 						✓	ongoing
							✓	ongoing
							✓	ongoing
Action 4 Enact a national legislation for Ghana	<ul style="list-style-type: none"> Revise the draft legislation in order to finalize for cabinet approval and enactment Compliance, Monitoring and Enforcement Workshop and also establish a solid CME system 						✓	✓

Action Points	Activities	Year							
		2009	2010	2011	2012	2013	2014	2015	
Action 5 Biological Baseline Surveys	<ul style="list-style-type: none"> Organize marine/port biological baseline, surveys Collaborate with the Universities to let them conduct biological baseline survey for the Port of Takoradi and the Sekondi Naval Base as well as Off Shore terminals set-up a marine biological monitoring system for marine biological baseline activities 		√	√		√	√		
				√		√	√	To be carried out in Takoradi port and Sekondi Naval Base	
Action 6 International co-ordination	<ul style="list-style-type: none"> Participate in regional and international meetings Contribute actively in the strategic co-ordination efforts of Guinea Current Large Marine Ecosystem (GCLME/IGCC) 	√ ongoing	√ ongoing	√ ongoing	√ ongoing	√ ongoing	√ ongoing		√ √

Action Points	Activities	Year						
		2009	2010	2011	2012	2013	2014	2015
Action 7 Commence capacity building activities in Ghana	• Set-up a BWM/ Marine Pollution Fund						√	√
	• Set-up a ballast water coordinating unit at the Ghana Maritime Authority (GMA)						√	√
	• Set-up ballast water laboratories at the seaports of Ghana						√	√
	• Supply mobile inspection equipment						√	√
	• Education of personnel						√	√
	• CME workshops						√	√
Action 8 Prepare certification procedures	• Set-up the procedure for preparing ballast water management certificates				√	√	√	√
	• Set-up procedures for approving reception /treatment facilities						√	√