2016

SUDAN NATIONAL BALLAST WATER MANAGEMENT STRATEGY

V

Empowered lives.
Resilient nations.

Table of Contents

1.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 90% 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 more than 10,000 marine species each day may be transported across the oceans in the ballast water of cargo ships and introduced into a non-native environment. As ballast water may be fresh, brackish or saline, the coastal environment, estuaries and navigable inland waters, are most at risk.

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). Thus, on 31 December 2015, 47 States had ratified the BWM Convention representing 34.35% of world tonnage. The convention will come into force 12 months after 30 states representing 35% of world tonnage have ratified same.

In Sudan, 85 to 90% 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 Sudan Sea Ports Corporation (SPC) and Maritime Administration Directorate have no records on ballast water management practices by ships calling Sudanese ports. Sudan 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 Sudan 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. Sudan has ratified other environmental treaties which have some relevance to the issue of IAS but not specifically with ballast water as a vector. There is currently no regime in Sudan that regulates ballast water activity.

The important commercial quantities of oil and gas transported from Sudanese ports coupled with the increases in imports and exports has undoubtedly lead to increased shipping traffic calling at the sea ports of Sudan. 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 Maritime Administration Directorate should be mandated through primary legislation to pursue the ratification or accession and implementation of international maritime conventions in conjunction with the appropriate ministries and take steps to ratify the BWM Convention. This should be followed by the enactment of a National Ballast Water Management Act. Sudan 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-facetted approach involving inter-sectoral agencies and institutions. These would include the following:

- General Directorate for Environmental Affairs of the Ministry (MENRPD)
- General Directorate for Environment and Safety of the Ministry (MO&G)
- Maritime Administration Directorate (MAD)
- Sea Ports Corporation(SPC);
- Higher Council for Environment and Natural Resources. (HCENR)
- Marine Environnent Protection Administration (MEPA)
- Fisheries Commission of the Ministry of Fisheries and Aquaculture
- Academic and Research Institutions (including Red Sea Universities, Red Sea Institutes) of the University of Sudan,
- Maritime education and training centers in or outside Sudan

It is crucial to place a high priority on raising awareness about the problem of Harmful Aquatic Organisms and Pathogens 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. Acronyms and Glossary

Acronyms

BWM	Ballast Water Management
BWMC	International Convention for the Control of Ships Ballast Water and Sediments, 2004
BWPS	Ballast Water Performance Standards
CBD	Convention on Biodiversity
CLC	Civil Liability Convention
CME	Compliance monitoring & enforcement
DWT	Dead Weight Tonnage
EPA	Environmental Protection Act
EZ	Exclusive Economic Zone
GBP	GloBallast Partnerships Project
GEF	Global Environment Facility
GISIS	Global Integrated Shipping Information System (IMO)
GISP	Global Invasive Species Program
GloBallast	GEF/UNDP/IMO Global Ballast Water Management Programme
GT	Gross Tonnage
HAOPs	Harmful Aquatic Organism and Pathogens
HCENR	The Higher Council for Environment and Natural Resources
IAS	Invasive Alien Species
ICZM	Integrated Coastal Zone Management
IMLI	IMO International Maritime Law Institute
IMO	International Maritime Organization
INC	Interim National Constitution
LA	Lead Agency
LME	Large Marine Ecosystem
LSCI	Liner Shipping Connectivity Index
MAD	Maritime Administration Directorate
MARPOL	International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978.
MENRPD	Ministry of Environment, Natural Resources &Physical Development
MEPA	Marine Environment Protection Administration
MEPC	Marine Environment Protection Committee (IMO)
MO&G	Ministry of Oil and Gas
MOTRB	Ministry of Transport, Roads and Bridges
MOU	Memorandum of Understanding
NBWMS	National Ballast Water Management Strategy
NGO	Non-Governmental Organization
NOBOD	No Ballast On Board
NTF	National Task Force
OPRC	Oil Pollution Response Convention
PBBS	Port Biological Baseline Survey
PERSGA	Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden
PDOC	Petrodar Operating Company
PSC	Port State Control
PSCO	Port State Control Officer
RSLME	Red Sea Large Marine Ecosystems
RTF	Regional Task Force
SOLAS	International Convention for the Safety of Life at Sea (IMO)
SPC	Sea Port Corporation
SSMO	The Sudanese Standards and Metrology Organization ()

STCW	International Convention on Standards of Training, Certification and Watch keeping for Seafarers
WMU	World Maritime University

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 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 a etiological 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.
Non- Invasive	An established species introduced that remains localized 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	Undertaking the tasks required to determine the level of risk.
Risk Analysis	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 Convention
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.Introduction

3.1 Background to the issue of IAS

3.1.1 Internationally and regionally

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 clear 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.

3.1.2 IAS in Sudan

IAS has emerged as a topical issue in Sudan 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.

Up to now it appears that there are not any published studies, surveys recorded, reported or observed that there are marine invasive alien species particularly Harmful Aquatic Organism and Pathogens (HAOPs) in the Sudanese waters during the past years until now.

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 NOBOD, 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 13th February 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 Sudanese Situation

The issue of ballast water has not received serious attention in Sudan. Both SPC and MAD do not have records on ballast water management practices by ships calling Sudanese ports. To ensure proper handling of ballast water, most shipping companies the vessels of which are calling at Port Sudan have ballast water management plans and ballast water logs on all their ships. MAD however has no indication of adequate ballast water management practice in accordance with the exchange or quality standards on board those vessels. (it is important at this stage to sense the status of ships calling at Sudan ports with regards to their own BWM procedures and practices.)

As stated earlier Sudan 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 Sudan 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.

No rapid status assessment of the environmental and legal framework of Sudan as well as an economic assessment in relation to BWM in Sudan has been conducted up to now. Sudan however 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 common law country, in order for Sudan 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 International Convention on Civil Liability for Oil Pollution Damage CLC 92;

j. 2001 International Convention on Civil Liability for Bunker Oil Pollution Damage (BUNKER);
k. 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. Sudan was one of the 196 countries which signed the Convention on Biological Diversity during the Earth Summit in June 1992 and ratified it on 30 October 1995. 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 Sudan being one of the early countries to ratify the Convention on 30 October 1995, 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 157 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. Sudan 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 23rd January 1985. As a consequence, among others, the Territorial Waters and Continental Shelf Act, 1970 has been passed into an Act of parliament (قانون المياه الإقليمية والجرف القاري لسنة 1970م)

UNEP Regional Seas Conventions

UNEP Regional Seas Conventions aim 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.

Sudan signed the Regional Convention for the Conservation of the Red Sea and Gulf of Aden Environment (Jeddah Convention) 14 February 1982.

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) – (k) above are require incorporation in a national bill entitled the Marine Pollution Bill which should then be enacted into Sudanese legislation. Once done, it is necessary for the quick passage of the bill into an act.

It is pertinent to note that all the environmental protection 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. Whist 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-facetted 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 Sudan

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 to 90% of Sudan's international trade by volume being carried by sea, the issue of ballast water being a vector for the transfer of IAS into Sudan'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 an essential source of employment in the country, and a major generator of foreign exchange. In 2015 about 57 Shipping Agencies operated in the country. There were 33 companies registered as Freight Forwarders. The Sudan Sea Ports Corporation had 6500 employees while the 25 private stevedoring operators in the port employed about 850 workers. The Sudan Dock Labour Company, the main supplier of dock workers had 425 on its register.

Sudan currently has a total of 22,323 GT on her register, with 4 fishing vessels, 22 vessels cargo vessels. Other vessels are small crafts. According to the 2015 UNCTAD Liner Shipping Connectivity Index (LSCI) Sudan is ranked 73 in the world. This represents a 40% improvement from 2013. This is a good indication of the economic impact of shipping activities in the country. UNCTAD's "Liner Shipping Connectivity Index" (LSCI) is an indicator for access to liner shipping services. The higher Liner Shipping Connectivity leads to lower trade costs.

3.4.2 Environmental impact

In 1979, Sudan announced the discovery of onshore oil in large quantities but it was only in February 2010 that the Sudanese government started drilling its first overseas offshore exploration well in the Red Sea Basin off Sudan with the cooperation of the state China National Petroleum Corporation (CNPC).

It can be said that both onshore and offshore oil export, pose 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 figures from Sea Ports Corporations (SPC) show increase in imports and exports passing through the ports. Container traffic at the Sudan port has risen by 35.29% % since 2011, hitting 565 811 containers in 2013, according to the Sea Ports Corporation (SPC).

In 2014, total trade through Sudan ports amounts 3,464,688tonnes with 3,220,340 tonnes import against 244,348tonnes export. Oil export alone amounts for more 70%.

Port traffic is projected to drastically rise in the next ten years. 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 cholera*e 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 diarrheal diseases remain a significant threat to public health in Sudan. Outbreaks of

cholera are cyclical and the frequency of these outbreaks is increasing. As cholera (*Vibrio cholera)* is known to mutate into new strains and travel widely in ship ballast, the introduction of virulent strains into Sudanese coastal waters could pose a serious health threat. Additionally, the spread of toxic phytoplankton and increasing occurrence of harmful algal blooms in Sudanese coastal waters could also be of significant health concern.

3.5 Scope

3.5.1 Geographical Scope of Sudan

The coastline of Sudan stretches for approximately 853 kilometers. According to the Territorial Waters and Continental Shelf Act, 1970, Sudan has a territorial sea of 12 nautical miles, a contiguous zone of 18 nautical miles from the outer edge of the territorial sea or 30 nautical miles from the baseline from which the breadth of the territorial sea is measured. The continental shelf lays to 200 m depth or to the depth of exploitation. The five seaports Port Sudan North and South, Port Sudan Green Harbor, Al Khair, and Osman Digna as shown in Figure 1. Bashayer 1 and 2 oill terminals are single buoy mooring.

Figure 1: Map showing the coast of Sudan

Figure 2. Maritime zones delimitation of Sudan. The Red Sea coast of Sudan, its Exclusive Economic Zone (EEZ) and shelf waters to 200 m depth. Total sea area contiguous zone: 18 NM continental shelf: 200-m depth or to the depth of exploitation territorial sea: 12 NM Length of coastline total 853 km.

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 Sudan. 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.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 Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden; PERSGA, will help in the management of cross border IAS issues, the Local PERSGA Focal Point in Sudan should be represented at the National Task Force (NTF) for ballast water issues to bring its expertise therein. Through the GloBallast programme, the IMO organized in the past respectively regional and national workshops for Ballast Water Control and Management for the PERSGA countries at Jeddah in 2005 and 2 to 5 September 2013 in Port Sudan to encourage countries to deal with BWM issues particularly with the CME and also to undertake among others 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.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, Roads and Bridges MTRB

The Ministry of Transport, Roads and Bridges has oversight responsibility over MAD and SPC for the shipping industry. MAD should be the National Focal Point for ballast water management–and should be 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, SPC 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, Natural Resources &Physical Development MENRPD is the national focal point for biodiversity in Sudan under the Convention on Biological Diversity to which Sudan is a State Party. Biodiversity includes the marine biodiversity and IAS and consequently the role of MEPDNR cannot be underplayed.

Marine Environment Protection Administration (MEPA)

The MEPA is the leading governmental agency responsible for the protection and improvement of the Sudanese marine environment. In accordance with its mandate it is envisaged that the MEPA 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 MENRPD and collaborate with the MAD and other relevant bodies involved in ballast water management. MEPA would also be involved in aspects of research, monitoring and evaluation.

The Sudan National Petroleum Corporation SNPC

In line with its mandate, SNPC 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 Sudan. To ensure that petroleum operations do not damage the marine environment through ballast water uptake and similar activity, SNPC 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 MEPA.

Faculty of Marine and Fisheries Science of the Red sea University

Major research in fisheries is conducted at the Fisheries Research Centre, Animal Resources Research Corporation (Ministry of Animal Resources, Fishery & Pastures), which has in place specialized stations that are geographically situated to cover major marine and inland waters. As a result, the following research stations are available:

- Fisheries Research Centre, headquarters - Khartoum
- Red Sea Research Station - Port Sudan

The Port Sudan Red Sea Fisheries Research Station involves itself mainly with the marine fishery. Research in fisheries is also undertaken at the Department of Fisheries and Wildlife Sciences, College of Animal Production Science and Technology of the Sudan University of Science and Technology, Khartoum North; the Red Sea University, and at some other universities within the country.

It is envisaged that both research centers will be of the key agencies to make available to the MAD, MEPA, SPC amongst others on an ongoing basis available data on Sudan's oceanography and biological baseline information based on their research activities. SPC and the research departments should regularly undertake such joint surveys to ensure early detection of any adverse ballast water impact on the marine ecosystem.

Red Sea State Local Government RSSLG

The relevant Red Sea State Local Government structures, will be the connecting node between the public and ballast water management stakeholders. In this regard, the public should be educated through its relevant structures on IAS detection and the reporting procedure at the Local Government ministries and offices. The Local Government relevant structures 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

Sudan is a coastal state with many coral reef and mangroves. Also notable is the fact that Sudan has five sea ports; the Port Sudan North and South with the Green Harbor, Al Khair Oil Product Terminal, Bashayer-1 Crude Oil Terminal, Bashayer- 2 Crude Oil Terminal and Osman Digna Port. The oil exploitation activities in Sudan'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.

5.2.3 Social or economic targets

The environment may be defined 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 of Sudan. 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.

MENRPD oversees environmental policy formulation but currently there is no specific policy for the marine environment with regards to ballast water management and IAS. There is a need for example to develop community education programmes that highlight the impacts of aquatic invasive species on coastal communities. These could be integrated with programmes of community-based monitoring that involve recreational scuba, divers or fishers.

Under this strategy, it is envisaged that MENRPD 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 Sudan should develop an environmental education strategy which should be implemented by the MEPA. 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: MENRPD to take steps to formulate a policy on marine biodiversity and draft enabling domestic legislation on biological diversity

.

6. Invasive Alien Species

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

To date there is not acknowledged data on actual status of IAS in Sudan waters as no biological baseline survey was carried out in port areas and outside within the Sudanese waters.
SPC should commission the Department of Marine and Fisheries Sciences of the Red Sea University to conduct a port biological baseline survey for Port Sudan to obtain marine biological baseline data for the port basin and its environ to determine the adverse effects, if any of BWM activities in the port waters and its environs. A similar study is recommended for Al Khair, and Osman Digna.

Strategic Priority 3: Periodic port biological baseline surveys should be conducted within Sudan's five sea ports to document and update on all native, alien and cryptogenic species that

are found within Sudan's marine and coastal environment by the Faculty of Marine and Fisheries Sciences of the University of Red Sea.

6.1.1 Integration of BWM into broader IAS management and coastal management process

The management and conservation status of the coastal zone of Sudan is low especially in terms of planning, co-ordination and monitoring. The National Integrated Coastal Zone Management Plan of Sudan seeks to address issues concerning coastal resources and biological diversity. It 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 Sudan 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 Sudan's ICZM plan.

6.2 Sudan's International Obligations

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

As stated earlier Sudan is yet to ratify the Ballast Water Convention and until this is done Sudan 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 ports and the likelihood of ship ballast exchange operations, Sudan 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 Sudan, the country is not bound by international obligations that arise under this convention.

6.3 Responsible Agency or Department

The Maritime Administration Directorate should be mandated under appropriate primary legislation to pursue the ratification or accession to and implementation of international maritime conventions in conjunction with the appropriate ministries in particular take steps to ratify the Ballast Water Convention. The procedural steps for ratification of the BWM Convention should be in conjunction with the Ministry of Foreign Affairs and the Attorney-General's Department through the Sudanese mechanism to incorporate international treaties.

Strategic Priority 5: MAD 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 national IAS strategy and action plan. *Ref: National Biodiversity Strategy and Action Plan 2015 -2020 Higher Council for Environment and Natural Resources.* (HCENR) was established to oversee, coordinate and liaise on issues pertaining to, and linked with, the environment. However, it is apparent that more emphasis has been placed 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:

- The Higher Council for Environment and Natural Resources. (HCENR);
- Wildlife Division of the Forestry Commission
- Water Research Centre
- Faculty of Marine and Fisheries Sciences of the University of Red Sea
- The Institute of Marine Research
- The Marine Fisheries Research Centre

The various roles of the relevant stakeholders to address the issue of IAS and ballast water management have been spelt out in Table 4.

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 Sudan 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 Sudan. As a dualist state, it is only when this Convention has been ratified that its provisions can be translated into domestic Sudanese 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 then 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 no draft bill on BWM presented to parliament. A draft bill which should be regulatory in substance will seek to address the issue of ballast water management in Sudan. As stated above, there is currently no regime in Sudan that regulates ballast water activity. The IMO/GloBallast Model Ballast Water Management Act, Final Draft, 2010 is used for drafting the Sudan Ballast Water Management Bill.

The bill will be based on the provisions of the BWM Convention. The bill will create a new regime which will seek to regulate ballast water activity as a way of preventing IAS through ballast water. It should lay down comprehensive enforcement provisions for both Sudanese flagged vessels and foreign flagged vessels through port state control. The bill also should lay down an adequate

penal regime for contravening the provisions of the Convention.

The draft bill obliges ships operating under the Sudanese 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 Sudanese flagged vessels and issue the appropriate BWM certificate.

The draft bill will also make 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 the draft bill will enjoins SPC or terminal operator to provide adequate facilities for the reception of sediments and repair of ballast tanks. In this regard, the draft bill should provide a format to report the inadequacy of reception facilities.

As a State Party to the BWM Convention, the draft bill should ensure that Sudan through the MAD 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 should enjoin Sudan to notify through the GISIS the IMO and mariners of areas in Sudanese 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 draft 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 Faculty of Marine and Fisheries Sciences of the University of Red Sea should be commissioned by SPC to carry out a biological port baseline survey on a regular basis to ascertain the marine eco-system and biodiversity and to determine if it may be 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 port baseline surveys should ensure regular monitoring of the port basin and its environs.

7. Ballast Water Management

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

The obligations which are defined by the Convention are listed below.

Firstly, the obligations for ships are:

Table: 1 The obligations for ships

THE OBLIGATIONS FOR SHIPS
Have onboard a Ballast Water Management Certificate
Have onboard a Ballast Water Management Plan
Ship owner to Define a responsible personnel on board accountable for Ballast Water Management
Have on board a Ballast Water Record Book
Make exchange operations in the transition period of the convention and after this, install an approved treatment facility on board and treat the ballast water
Giving sediments to the reception facilities when undergoing repairs
Reporting the ballast operations with the Ballast Water Reporting Form

The obligations for Maritime Authorities are:

Table: 2 The obligations for maritime authorities

THE OBLIGATIONS FOR MARITIME AUTHORITIES
Define a Ballast Water Management Strategy and prepare an Action Plan
Promote the scientific studies
Prepare the national legislation
Issue ballast water certificates to ships
Grant type approvals to Ballast Water Treatment Facilities
Determine the exemptions for applications
Port state controls
Ballast water sampling
Compliance and enforcement
Coordinate the port biological surveys
Attend to coordinate regional arrangements
Define alternative ballast water exchange areas
Define applications for the ships that is not in the scope of the convention

The obligations for Port Authorities are as below:

Table: 3 Obligations for port authorities

THE OBLIGATIONS FOR PORT AUTHORITIES
Compliance and enforcement
Provide with the Ballast water reception facility

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. MAD should be favored for its general mandate to deal with IMO safety and environment related conventions 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. MAD is expected to be the Lead Agency and as such its role and functions should be amply 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 5.

7.2 Ballast Water Management Plan

Currently, there is no approved ballast water management plan in Sudan. The draft bill should 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 Sudan has no identifiable BWM Certificate. Again the draft bill should adopt the BWM Certificate contained in the Annex to the BWM Convention. This document certifies that a Sudanese 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.

7.2.2 BWM Plan

Sudan has not formulated any BWM Plan for ships flying its flag. The draft bill should also adopt the BWM Plan as is contained in the BWM Convention to address this lack. When the draft is enacted the BWM Plan for Sudanese flagged and foreign vessels who are parties to the BWM Convention would be a statutory requirement.

7.2.3 BWM Record Book

Sudan has not formulated any BWM Record Book for ships flying its flag. The draft bill should also adopt the BWM Record Book as is contained in the BWM Convention to address this lack. When the draft is enacted the BWM Record Book for Sudanese 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 Sudanese waters and consequently there is no regime to ensure compliance of such vessels. The draft bill should apply to all Sudanese 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 should also ensure that Sudanese flagged vessels apply the standards and requirements laid down in the BWM Convention.
To ensure ongoing compliance, when MAD 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

Sudan does not carry out any inspection of ships to ascertain their compliance with BWM. The contemplated draft bill should empower the MAD to carry out ballast water management inspections both on Sudanese 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 contemplated draft bill should lay down a penal regime for offences and acts contravening the provisions of the Act up to a maximum of XY,000 penalty units. In Sudan, a penalty unit is equivalent to SDG WZ.00. *(The penalty unit should be fixed in accordance with Sudanese national the legal system)*

Strategic Priority 7: The 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. 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-facetted approach involving inter-sectoral agencies and institutions. These would include the following:

- Maritime Administration Directorate
- Sudan Seaport Corporation

- Marine Environment Protection Administration
- Academic Institutions (Faculty of Marine and Fisheries Sciences of University of Red Sea).
- Relevant department of the Ministry of Health
- Research Institutions
- Red Sea Large Marine Ecosystem
- Marine Fisheries Research Division of the Ministry of Animal Resources, Fishery & Pastures.
- The Marine Security Unit.

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 5.

The primary responsibilities of The National Ballast Water Management Task Force are:

- Advise/decide on who should be the Lead Agency (where not already established);
- Gather all data, opinions, and information suggested in the questionnaire above;
- Consider all the relevant facts concerning ships that visit the ports and all other related matters and
- Be able to realistically balance the competing interests and propose the optimal National Policy and Strategy;
- Make recommendations on suitable polices practices, legislation, operational procedures and responsibilities;
- Edit and revise draft of National Strategy;
- Implement arrangements of National Strategy;
- Develop and implement of a review/evaluation plan;
- Potentially continue to work together after the development of the National Strategy to provide Guidance, oversight, and advice on matters relating to harmful aquatic organisms and pathogens,
- While the Lead Agency is primarily responsible for administering the operational arrangements (or if the Lead Agency is an expert in IAS, then the Task Force could stay on to provide guidance on ballast water management).

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.

The overall responsibility of the Lead Agency is to oversee implementation of the national strategy.

To this end, the Lead Agency addresses the following:

- Integration of the National Strategy into pertinent national policies/strategies and ensuring that necessary legislation is in place;
- Developing and ensuring implementation of necessary scientific, operational and administrative arrangements for all ships visiting the country's ports;
- Ensuring that all key stakeholders are fully conversant with the National Strategy, appropriately trained and properly authorized to act on its behalf, where required;
- Monitoring and reviewing on an ongoing basis how effectively the National Strategy is being implemented and introducing changes, as necessary;
- Ensuring effective enforcement of national laws and regulations;
- Administration of relevant international instruments related to ballast water management;
- Incorporating into the National Strategy improved measures that become possible due to experience gained in operating the National Strategy and/or through developments in research or technology, or changed international requirements or 'best practice';
- Ensuring the ongoing liaison and cooperation of all key stakeholders; and
- Participating in international, regional and national matters relating to BWM.

It is evident that the MAD should adopted that role with regards to BWM. But it is pertinent to note also that MEPA as the Focal Point under the National Strategy on IAS, implement policy guidelines and execute maritime related action plan for Sudan. It is noteworthy that the national strategy on IAS in Sudan 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 MAD would play its lead role in close collaboration and partnership with the MEPA for IAS of the marine ecosystem.

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

8.1.3 Advisory Groups or Task Force

A National Task Force (NTF) on ballast water management was set up but could not function due to various challenges and setbacks particularly he lack of concerted organization, lack of budget, logistics and coordination. It comprised representatives of most of the relevant players whose roles are crucial to the strategy. The representation of the NTF included the following:

- Port Sudan North and South Port,
- Alkhair Oil Terminal
- Osman Digna Port
- Al Akhdar Port
- Bashayer-1 Crude Oil Terminal
- Bashayer-2 Crude Oil Terminal
- Maritime Inspection Directorate
- The Petrolines Petroleum Operating Company (PPOC)
- The PetroDar Operating Company Ltd (Petrodar)
- the Marine Environment Protection Administration
- Sudan Shipping Lines
- Marine Security Unit
- Marine Fisheries Directorate

- Sudan National Petroleum Corporation
- The Ministry of Tourism and Antiquities and Wildlife
- Sudan National Oceanographic Data Centre (SNODC)
- Institute of Marine Research Red Sea University,
- Faculty of Marine Sciences and Fisheries (FMFS)
- Port Sudan Refinery

It has been noted that the Sudanese institution in charge of Planning is not currently represented on the NTF and it is recommended that same should be adequately represented.

The appropriate list should be reviewed to include any stakeholder which has a relevance to the general issue of marine IAS, ballast water in particular and shipping and general safety and environmental issues of the country.

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 Sudanese institution in charge of planning or The National Council for Strategic Planning 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 4 below:

Table 4.

	ACTION POINTS	SPECIFIC ACTIVITIES	RESOURCE ORGANISATION
1	Policy formulation	Stakeholder engagement • Public workshop and discussion • Stakeholders consultation • Formulation of draft policy	Under auspices of MENRPD in collaboration with Sudanese institution in charge of planning or NCSP, MEPA, MAD, Public, SPC, Ministry of Transport. Sudan Fifth National Report to CBD of the HCENR of MEPDNR Annex 9 refers

	ACTION POINTS	SPECIFIC ACTIVITIES	RESOURCE ORGANISATION
2	Ratification of BWM Convention	• Depositing of instrument of Ratification at IMO. • Drafting of bill in relation to BWM Convention. • Review of Bill by Cabinet • 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.	MAD, Ministry of Justice, Ministry of Foreign Affairs and Parliament of the Republic of Sudan(National Assembly)
3	Research, Monitoring and Evaluation	• Water and sediment quality and biological assessment of port areas and Sudan'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.	Faculty of Marine and Fisheries Sciences of University of Red Sea, MEPA, Research Institute, SPC
4	Education and Dissemination		District, Municipal and States 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, Sudan 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 Sudan a more simplified administration. If applied strictly, the uniform approach will offer the state greater protection from unanticipated bio-invaders, 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 Sudan 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 Sudan, the major stakeholders in the maritime industry are the Sea Ports Corporation (SPC) and the Maritime Administration Directorate (MAD). 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 Sudan'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 the Red Sea, the MEPA and the Ministry of Environment, Physical Development & Natural Resources can support the MAD and SPC 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 Country. 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. PSCOs of the MAD are most suitable to be on the front line of ship compliance monitoring.

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 Legislation and Regulation

In the Sudan, federal system there are three levels of authority: national level, state level and locality level. The powers over land and other natural resources are divided among the various levels as follows:

- At the national level, the federal organs exercise the power of planning, legislation and execution on federal lands, natural resources, mineral and subterranean wealth, inter–state waters, national electricity projects, epidemics and disasters.
- The state organs within the boundaries of the state exercise power on state lands, natural resources, animal resources, wildlife, non-Nile waters and electric power.
- There are concurrent powers where both federal (national) and state organs exercise power on education, health, environment, tourism, industry and meteorology.

This section presents relevant environmental policies, legislative and administrative frameworks at state, federal and international level. Focus has been given to state level organizations that are responsible for preparation of environmental policy, technical guidelines, review and follow-up of implementation of environmental safeguard measures.

8.3.1 National Policy and Strategies

The 2005 Interim National Constitution (INC) of the Republic of the Sudan, which came shortly after the signing of the Comprehensive Peace Agreement (CPA) between the ruling National Congress Party (NCP) and the Sudan People's Liberation Movement (SPLM), was the first in the history of Sudan to formally recognize the subject of "Environmental Pollution and Ecology" and placed the subject on the Concurrent Legislative List. Environment and social justice enjoy the protection of the INC where in Chapter II: Guiding Principles and Directives, Section 11 on Environment and Natural Resources:

- guarantees the right of the Sudanese's people to clean and diverse environment while imposing a duty on the citizens to preserve and promote the country's biodiversity;
- precludes the State from pursuing any policy, or taking or permitting any action, which may adversely affect the existence of any special animals or vegetative life or their natural or adopted habitat; and
- guarantees that the State shall promote, through legislation, sustainable utilisation of natural resources and best practices with respect to their management.

The Interim Constitution provides for the creation of commissions, particularly on land to assume among others planning and division of lands and forests between federal and state authorities. Section

12 requires the State:

- to develop policies and strategies to ensure social justice through ensuring means of livelihood and opportunities of employment.

- to encourage mutual assistance, self-help, cooperation and charity.

Section 24 describes the Sudan as the decentralized State with three levels of government:

- the national level of government with the power to protect national sovereignty, and territorial integrity of the entire Sudan and to promote the welfare of its people,

- the State level of government with the power to exercise authority at the State level throughout the Sudan, and render public services through the level closest to the people, and

- the local level of government, which shall be throughout the Sudan.

The Interim Constitution has five Schedules (Schedules A-F), which more specifically state the powers of the various level of government in respect of, among others, environment, land acquisition and conservation of cultural heritage. Such powers include:

1) Exclusive legislative and executive powers of the national level as stated under Schedule – A (Table -1):

Table: 1 The Interim Constitution, Schedule-A

No.	Description	Item No.
1	Natural lands and national natural resources.	15
2	Meteorology.	19
3	Signing of International Treaties on behalf of the Republic of Sudan.	25
4	National Public Utilities.	30
5	National Museums and National Heritage Sites.	31
6	National Economic Policy and Planning.	32
7	Nile Water Commission, the management of the Nile Waters and transboundary waters and disputes arising from the management of interstate waters.	33

2) Exclusive legislative and executive powers of a State of the Sudan as stated under Schedule C:

Table: 2 The Interim Constitution, Schedule-C

No.	Description	Item No.
1	State Land and State Natural Resources.	8
2	Cultural matters within the state.	9
3	Enforcement of state laws.	19
4	The development, conservation and management of state natural resources and state natural resources and state forestry resources.	21
5	Laws relating to Agriculture within the state.	23
6	Pollution control.	27
7	Quarrying regulations.	31
8	Town and rural planning.	32
9	State cultural and heritage sites… and other historical sites.	33
10	Traditional and customary law.	34
11	State irrigation and embankments.	36
12	State archives, antiquities and monuments.	38
13	State public utilities.	40

Schedule E provides for residual powers exercised by the relevant level of government depending on the nature to which they relate. Schedule F deals with the resolution of disputes in relation to concurrent powers at various levels of government. New legislations expounding the broad principles of the Interim Constitution may be enacted while revision or repeal of some of the existing laws might be considered in order to conform to the provisions of the Constitution.

Article 43 (2) of the Interim Constitution gives the federal government the right to expropriate land for development purposes and to compensate owners. There are a number of articles related to natural resource management, protection of cultural heritage sites and respect of traditional and customary regulations related to land ownership.

The Interim Constitution also specifies land issues which are under national powers (federal level) and those under the control of states as well as joint powers (concurrent powers) shared by federal and states. The States manage issues related to State lands which are not under national control. These include: management, lease and utilization of lands belonging to States, town and rural planning and agricultural lands within the State boundaries. The concurrent powers include matters related to urban development, planning and housing, electricity generation, waste management, consumer safety and protection, water resources other than inter-state waters and regulation of land tenure and the rights on land.

Legal Framework

Environment is a direct concern of the Federal Government of Sudan. The environmental protection was the concern of weakly enforced indirect provisions in local, provincial, and federal laws. These provisions were mainly designed to improve civic and factory conditions and the management of canals, forests, and wildlife.

In 2000 the federal cabinet directed the drafting of "an overall legislation for environmental protection". In the same year, the Ministry of Environment and Physical Planning was established.

The role of the Ministry or the concept of environment however, continued to be restricted to the living conditions and planning and housing sector. The most notable achievement in the 2001 was the enactment of the Sudan Environmental Protection Act (EPA). The EPA envisaged the HCENR as a policy making body and the environmental protection agency for implementation of the Ordinance.

Although without executive powers and scantily staffed, the HCENR enjoyed considerable international exposure. The HCENR met irregularly, the establishment of state environment and natural resources councils was very slow, federal and state environmental conservation strategies and standards are yet to be developed.

This is an "umbrella" law that clarifies the role of the Ministry of Environment, natural Resources and Physical Development as the competent Ministry responsible for coordinating all matters concerning the environment. However, the new law also acknowledges that other Government Ministries with particular competence in certain fields are responsible for developing environmental measures within their areas of competence, e.g. the Ministry of Transport as the appropriate Ministry to implement measures to prevent pollution from ships.
Currently, Sudan has neither a National Conservation Strategy together nor a National Environmental Action Plan that set policy level directions and priorities for the Government of Sudan.

8.3.2 Compliance and Enforcement (CME)

The CME system must meet three essential criteria; It must be:

- based on, and fully consistent with, the BWM regime that it forms part of;
- consistent with the IMO BWM Convention;
- capable of assessing whether the Port State's BWM requirements have been met, and if not, ensuring that appropriate action is taken.

Inspections serve to ascertain compliance with both the requirements of the State and also those of the Convention. In addition to satisfying the essential criteria described above, any comprehensive and effective CME system should have a number of key elements. These include:

1. Requirement for ships to collect and record information about their BWM practices (i.e. uptake, management en route and discharge);
2. Means for ships to transmit this information to the Port States BWM regulatory authority and receive directions from them;
3. Provision for examination/auditing of the ships, official log books or other official records to ascertain compliance with the BWM requirements of the Port State;
4. Ability by the appropriate authority to take ballast water and sediment samples and carry out any necessary measurements;
5. Legal provision for "enforcement", where necessary, for non-compliance with the required BWM requirements and provisions for applying sanctions to violations;
6. Requirement for notification of arrangements to IMO; and
7. Effective communication arrangements on a regional level to ensure proper tracking of violations and exchange of experience during the application of the CME system on a national level.

Sanctions or penalties in case on non-compliance should apply.

Two tools exist to document ballast water information:
(a) the Ballast Water Record Book (BWRB) and
(b) the Ballast Water Reporting Form (BWRF).

The BWRB required by the IMO BWM Convention for collecting and recording this information and becomes a component of the official logbooks and must be available to Port States during inspection

to assist with verification of compliance. This BWRB should include information such as location, day, time and dimension of each ballast operation.

The convention, however, does not include specific reporting requirements although the regulations on BWM plans refers to such requirements. A port State may introduce such requirements – and in this case this should be done by using the IMO BWRF to ensure the necessary standardization of such reporting.

8.3.3 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. It requires close cooperation and coordination with neighboring countries and trading partners, and amongst international stakeholders This will ensure harmonization of programmes through the exchange of experiences and information sharing.

Strategic Priority 13: Promote Regional Cooperation and ensure that national strategy is harmonized with the Regional Strategic Action Plan through PERSGA 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 Sudan'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 Sudanese ports.

The Arab Academy of Science & Technology and Marine Technology (AAST&MT) and the Institute of Marine Research Red Sea University, Faculty of Marine Sciences and Fisheries (FMFS) could be asked to include the subject in the curriculum for sea training to make seamen and officers trained abroad and locally aware of the problem and how to manage it.

The Recommended Actions of the Sudan Fifth National Report to CBD of the HCENR of MENRPD Annex 9 as follows refers:

i. Develop and implement a public awareness program about the invasive species and their impact on biodiversity and livelihood of the local communities (Aichi Target 9).
ii. Encourage media organizations and extension workers to participate in dissemination of information about the impact of invasive species (Aichi Target 9) ...
iii. Support education institutions to incorporate issues of invasive species, identification, prevention, eradication and management into their curricula (Aichi Target 9).
iv. Develop database of invasive species, identification guides and make the information accessible to the Stakeholders (Aichi Target 9).
v. Qualify and train taxonomy specialists in plants, Animals, forestry, wildlife, fishery, birds and insects.

8.4.1 National Governmental Agencies

- Sea Ports Corporation (SPC);
- Maritime Administration Directorate (MAD);
- Marine Environnement Protection Administration (MEPA).
- Ministry of Transport, Roads and Bridges; (MOTRB)
- Ministry of Environment, Physical Development & Natural Resources (MENRPD)
- Ministry of Animal Resources, Fishery & Pastures
- Fisheries Research Centre, Animal Resources Research Corporation (Ministry of Sciences)
- Department of Fisheries and Wildlife Sciences, College of Animal Production Science and Technology of the Sudan University of Science and Technology, Khartoum North
- Red Sea Research Station - Port Sudan
- Ministry of Health
- Ministry of Oil &Gas

8.4.2 Industry

- Sudan Shipping Line (SSL);
- Shipping and forwarding agencies;
- Fishing Boats Association or Union;
- Sudan Merchant Marine Officers Association;
- Port Sudan Refinery;
- Sudan National Petroleum Corporation,
- Petrolines for Crude Oil Ltd at Marine Oil Terminal Bashaer 1 and
- Petrodar Operating Company Bashaer 2

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. Funding

9.1 Implementation Funding (Initial 2 – 5 years)

Funding is a major challenge in this regard. While the national government role is major in providing necessary financial resources, all stakeholders have to be as creative and active as

possible to obtain funding from different internal and external sources for implementing the different proposed actions.

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
- GEF
- UNDP
- IMO Integrated Technical Cooperation Programme (ITCP)
- African Development Bank
- UNEP

Strategic Priority 14: Funding from the local component may be sourced from the Government of Sudan through the Ministry of Transport, Roads and Bridges (MAD, SPC) MENRPD, the National Environmental Fund (NEF) as well as the Biodiversity Trust Fund to be set up under the National Biodiversity Strategy and the Ministry of Oil & Gas.

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 MAD (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 MAD 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 Sudan through the Ministry of Transport (MAD, SPC…) and Ministry of Science and Communication 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 5 analyses the various current roles of the stakeholders, their strengths and weaknesses and their expected roles in the light of this BWM strategy. In view of the fact that this National Ballast Water Management Strategy has a direct bearing on IAS, the table below references 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.

Table 5. STAKEHOLDERS ANALYSIS-STAKEHOLDERS ROLES, STRENGTHS, WEAKNESSES AND EXPECTATIONS

Stakeholders	Roles	Strengths	Weakness	Expectations
Ministry of Transport, Roads and Bridges MTRB	• Formulate policies, programmes and plans in the areas of transport including shipping. • Has oversight responsibility for SPC and MAD for the shipping and general maritime industry.	• Has the capacity and mandate to institute arrangements for enhanced collaboration with other organizations in the maritime sector.	• Lacks adequate capacity (human financial and logistic) to coordinate the prevention, monitoring and management of threats of ballast water operations and IAS.	• Enhanced capacity to coordinate the prevention and management of ballast water management and IAS related issues.
Sea Ports Corporation	• Regulator of the sea ports of Sudan. Has regulatory functions over all port and shipping related operations.	• Has the capacity and mandate to institute arrangements and regulations over shipping activity in the sea ports.	• Lacks the capacity (infrastructural, human and financial) to implement ballast water operations for ships calling at the sea ports.	• Enhanced capacity (infrastructural, human and financial) to implement via MAD ballast water management operations for ships calling at the sea ports.

Stakeholders	Roles	Strengths	Weakness	Expectations
Maritime Administration Directorate	• Has the mandate to ensure the ratification of maritime conventions for and on behalf of Sudan. • Liaises and coordinates activities of maritime stakeholders. • Encourage and support the involvement of all stakeholder in alien invasive species management programs (Aichi Target 9). • v. Develop invasive species management plans that emphasize prevention of introductions, control and eradication of invasive species (Aichi Target 9).	• 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.	• Lacks the technical expertise to deal with BWM related issues. • Dependence on Sea Ports Corporation • Lack the capacity building to perform its responsibilities effectively and efficiently	• Autonomy to drive all sea related safety and environment convention issues • Improvement in capacity building through employment of adequate technical expertise. • Enhanced capacity to coordinate issues relating to BWM.

Stakeholders	Roles	Strengths	Weakness	Expectations
Minister of Environment, Natural Resources & Physical Development MENRPD	• Formulate policy on the environment and its protection. • Has oversight responsibility for MEPA. • Develop risk assessment and management programs and guidelines for newly introduced species (Aichi Target 9). • Develop and implement effective response procedures for the prevention of new potential invasive species (Aichi Target 9). • Develop effective systems and tools for monitoring and evaluation of invasive species (Aichi Target 9).	• Has the capacity and mandate to institute arrangements for enhanced collaboration with other organizations dealing with the environment and particularly the marine environment	• Lacks adequate capacity (human financial and logistic) to coordinate the prevention, monitoring and management of threats of ballast water operations transported IAS (HAOPs)	• Enhanced capacity to coordinate the prevention and management of ballast water management and IAS related issues in full collaboration with MAD, Research Institutes and other stakeholders.

Stakeholders	Roles	Strengths	Weakness	Expectations
Marine Environnemental Protection Administration (MEPA)	• 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. • Formulate and implement result oriented research on characterization of invasive species; vulnerability of ecosystems, social and economic impact; prevention, control, eradication and management methods (Aichi Target 9	• Has some trained personnel in all regional capitals in the country. • Collaborates with all States Environmental administrations on environmental issues. • Collaborates with major stakeholders (national and international) in the management of IAS.	• Inadequate logistic support (trained personnel, finance, equipment, transport) and lack of awareness on Aquatic IAS and HAOPs to undertake their roles effectively.	• Facilitate their roles in the formulation and implementation of policies on IAS management and particularly HAOPs.

Stakeholders	Roles	Strengths	Weakness	Expectations
Faculty of Marine Sciences & Fisheries Red Sea University	• Offers assistance to achieve environmental and resource sustainability. • Academic institution that carries out biological and taxonomic research, gathers data and monitors Sudan's coastal waters	• Has the technical expertise to offer the needed assistance to the NTF • Has requisite technical expertise for marine environmental research.	• Inadequate infrastructure and means. • Lacks logistics and funding to effectively carry out research and monitoring of Sudanese ports and full sea water domain.	• Play its role as a research and monitoring body for IAS ballast water related issues. • Carry out regular biological baseline survey of Sudan's sea ports and environs.

Stakeholders	Roles	Strengths	Weakness	Expectations
Ministry of Animal Resources, Fishery & Pastures MARFP	• Formulates all policies on Fishery production. • Directs on policies relating to IAS prevention and management. • Through the Department of Marine and Fisheries, monitors and carries out research on the marine fisheries resource.	• Have some trained personnel in all the regions and states of the country. • Have the ability to disseminate information to other Aquaculture farmers and other stakeholders through the extension and field staff.	• Trained staff in IAS recognition and prevention is inadequate. • Lacks adequate and appropriate quarantine facilities in the Red Sea State. • Lacks funds for data and research activities on impact of ballast water on marine fisheries	• Improvement in the existing facilities and infrastructure in IAS prevention, monitoring and management. • Liaising with Ministry of Transport and MEPDNR on IAS from ballast water activities and its impact on the marine fisheries resource. • Should be adequately funded

Stakeholders	Roles	Stre	Weakness	Expectations
Ministry of Oil & Gas	• Formulates energy policies for the government. • Exercises Ministerial responsibility over the Oil ports of Bashaer 1 and 2 and private power producers. • Contribute to the development of skills and competencies of environmental sustainability professionals through training, information and experience exchange, and the sharing of good practice.	• Have logistics through its environment department for surveillance of the offshore sectors.	• Inadequately trained personnel in IAS recognition, monitoring and management. • Insufficient logistical and financial support for IAS management.	• Existing facilities and human and financial resource base will be augmented and strengthened.

Ministry Of Environment, Tourism and Wild Life	• 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.	• Disseminates information at local government level. • Has some trained local council staff on the field to monitor and enforce bye-laws.	• Lacks adequately trained personnel to serve as liaison officers in the decentralization process. • Insufficient information dissemination facilities for effective communication at grassroots levels.	• 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 MAD/SPC/MEPA core unit staff for BWM and IAS.

Stakeholders	Roles	Strengths	Weakness	Expectations
Customs Division of the Sudan Revenue Authority (SRA)	• Collect customs and excise duties countrywide. • Patrol all the country's borders/entry points to check smuggled goods (including IAS) into Sudan. • Mandated to do IAS inspections at some entry points.	• Has personnel at all recognized entry points countrywide • Effects arrest of importers of recognized IAS.	• Inadequate capacity to monitor all unrecognized entry points effectively. • Most personnel have no training in the recognition of IAS. Total unawareness to marine IAS transported through ships ballast water	• 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. • Full awareness on marine IAS

Stakeholders	Roles	Strengths	Weakness	Expectations
Industry players	• Establish sediment reception facilities for ships. • Repair, maintenance and service of ships. • Ship scrapping.	• Expertise in repairs and maintenance, service vessels, scrapping of ships hold, pumping of ballast water tanks.	• Lack of sediment reception facilities.	• Strengthen capacity for environmental compliance. • Establish reception facilities for sediment treatment and disposal.

Stakeholders	Roles	Strengths	Weakness	Expectations
The Sudanese Standards and Metrology Organization (SSMO)	• Assessment of quality of fish exports. • Sets standards and ensures compliance	• Adequate expertise for the assessment of water quality standards.	• Lack of marine scientists	• Facilitate compliance of standards. • Employ marine scientists and collaborate with marine science institutions.
National Fisheries Association of Sudan and other Fisheries Associations.	• Report observations of new species of marine organisms and fish.	• They form a very large group • Always on the 'ground' and obtain first-hand information on non- native species.	• They need scientific orientation to report observations.	• Build capacity to facilitate recognition and reportage of non-native and invasive species.
Ministry of Health	• Provide health facilities nationwide and monitor disease outbreaks amongst other functions. • Strengthen quarantine measures and border control to ensure that intentional introductions are subject to appropriate authorization (Aichi Target 9).	• Have health posts and hospitals nationwide with the capacity to observe seafood poisoning from ingestion of IAS infested seafood. • Permanent presence at Port borders and on board of arriving ships	• Lack of logistical support and specialized training to identify seafood poisoning.	• 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
Sudan Shipping Lines & shipping Agents Association of Sudan	• The National Shipping Company and the Association of ship-owners and their agents established in Sudan to further the objectives of vessel owners and act as a common platform for advocacy of shipping.	• Vessel owners with interest in ensuring compliance with BWM guidelines and Convention	• Currently unclear which companies have ballast water treatment facilities on board vessels.	• Ship-owners and their operators should be fully compliant by 2017 in accordance with BWM Convention.

11. Action Plan Implementation Table

Action Points	Activities	Year						
		2016	2017	2018	2019	2020	2021	2022
Action 1 Establishment of National Task Force	• 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 and Action Plan		✓					
	• Plan Future Activities of the Task Force and review annually	✓	✓	✓	✓	✓	✓	✓
Action 2 Ratify the International Convention for the Control and Management of Ship's Ballast Water and Sediments (BWM Convention) through MAD's role	• MAD to step up efforts towards the ratification process as soon as possible		✓	✓				

Action Points	Activities	Year						
		2016	2017	2018	2019	2020	2021	2022
Action 3 Conduct awareness raising activities	• Organize a Ballast Water Management Symposium/ Workshops	✓	✓			✓		
	• Encourage media organizations and extension workers to participate in dissemination of information about the impact of invasive species. 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		✓	✓				

Action Points	Activities	Year						
		2016	2017	2018	2019	2020	2021	2022
Action 4 Enact a national legislation for Sudan	• 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			✓	✓	✓	✓	✓
	• Harmonize state and sectoral rules and regulations relevant to marine Invasive Alien Species and formulate policy and legislation for the control of introductions, movement and management of marine IAS introduced through ballast water (Aichi Target 9).		✓	✓	✓	✓	✓	✓
	• Enforcing the international regulation for maritime activities related to disposal of waste and ballast water.		✓	✓	✓	✓	✓	✓
	• Penalties for violations to BWM to be strictly enforced		✓	✓	✓	✓	✓	✓

Action Points	Activities	Year						
		2016	2017	2018	2019	2020	2021	2022
Action 5 Biological Baseline Surveys	• Organize marine/port biological baseline, surveys		✓	✓	✓	✓	✓	✓
	• Collaborate with the Universities to let them conduct biological baseline survey for all commercial ports as well as Off Shore terminals		✓	✓	✓	✓	✓	✓
	• set-up a marine biological monitoring system for marine biological baseline activities to Assess the movement of invasive species and develop maps of distribution of the most important invasive species (Aichi Target 9).		✓	✓	✓	✓	✓	✓
	• Produce an inventory of marine invasive species and evaluate their economic, social and environmental impacts (Aichi Target 9)		✓	✓	✓	✓	✓	✓
Action 6 International co-ordination	• Participate in regional and international meetings	✓	✓	✓	✓	✓	✓	✓
	• Contribute actively in the strategic co- ordination efforts of PERSGA and Arabian Sea	ongoing	ongoing	ongoing	ongoing	ongoing	ongoing	ongoing

Action Points	Activities	Year						
		2016	2017	2018	2019	2020	2021	2022
Action 7 Commence capacity building activities in Sudan	• Set-up a BWM/ Marine Pollution Fund		✓					
	• Set-up a ballast water coordinating unit at the Maritime Administration Directorate (MAD)		✓					
	• Set-up ballast water laboratories at the seaports of Sudan		✓					
	• Qualify and train taxonomy specialists marine IAS and HAOPs through shipping		✓	✓	✓	✓	✓	✓
	• Supply mobile inspection equipment		✓	✓	✓	✓	✓	✓
	• Education of personnel	✓	✓	✓	✓	✓	✓	✓
	• CME workshops	✓		✓		✓		✓

Action Points	Activities	Year						
		2016	2017	2018	2019	2020	2021	2022
Action 8 Prepare certification procedures	• Set-up the procedure for preparing ballast water management certificates		✓	✓				
	• Set-up procedures for approving reception /treatment facilities		✓	✓				
Action 9 Risk Assessment	• Establish approach to risk assessment, survey and monitoring programmes including reporting, alert mechanism and strengthen database of alien invasive species.		✓	✓	✓	✓	✓	✓