The Role of the Brazilian Ports in the Improvement of the National Ballast Water Management Program According the Provisions of the International Ballast Water Convention

Uirá Cavalcante Oliveira

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Abstract

Ballast water is the water used by ships for obtaining draft, trim, or stability; and usually it is taken and discharged into port areas during operations of unloading and loading cargoes. Ballast water has been identified as the main vector for the introduction of alien and harmful organisms into coastal zone waters, from which can originate ecological, social and economic impacts. In response to this problem, the International Maritime Organization has adopted the “International Convention for the Control and Management of Ships’ Ballast Water and Sediments” (2004), which was partially internalized in Brazil through a federal norm named NORMAM-20 that provides the general IMO guidelines for ships exchanging their ballast water in oceanic waters beyond 200 nm.

However, this measure presents limitations and a considerable number of vessels probably do not comply, or do so only partially. Therefore, the ballast water oceanic exchange cannot totally assure the prevention of new introductions. Port environment survey and monitoring systems are reported as essential to assess the risk of new introductions of harmful species and effective management of ballast water. In Brazil, the Port Authorities are responsible for leading the programs and measures of environmental control at their organized port areas mostly through the process of environmental licensing of ports. However, not many ports in Brazil have considered the ballast water issue as part of their environmental programs and the data raised cannot be integrated in a national management approach due the lack of specific standards and regulations.

This paper will provide an overview of the current international provisions, mainly those established by the IMO on the matter, as well as describe how the subject is currently treated in Brazil, including through a review of national legislations, institutions, and observations on the limitations of the current approaches. Considering the improvement of the Brazilian approach, this study also intends to identify legal requirements and procedures for ballast water management in the United States and European countries that could be applied in Brazil. Regarding the role of ports in the national ballast water management program, this study will also review the possibility of establishing standardized procedures for environmental licensing of ports and terminals in Brazil, including the necessary criteria for ballast water management.

Summary

WORKING TITLE:

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SUPERVISORS:

Prof. Günter Handl

Dr. François Bailet

Acronyms

AAPA	American Association of Port Authorities
ANSTF	U.S. Aquatic Nuisance Species Task Force
ANTAQ	National Agency for Waterway Transportation
ANVISA	National Health Surveillance Agency of Brazil
BWM	Ballast Water Management
BWMC	Ballast Water Management Convention
BWMA	Ballast Water Management Act
BWMP	Ballast Water Management Plan
BWRF	Ballast Water Reporting Forms
BWWG	U.S./Canadian Ballast Water Working Group
CCA-IMO	Brazilian Interministerial Coordinating Agency for IMO Affairs
CIESM	International Commission for the Exploration of the Mediterranean Sea
CONAMA	National Environment Council of Brazil
CONSSO	North Sea Committee of Senior Officials
CRIMP	Australian Centre for Research on Introduced Marine Pests
DPC	Directorate of Ports and Coasts of the Brazilian Navy
EEZ	Exclusive Economic Zone
EMBS	European Marine Biology Symposium
EU	The European Union
FATMA	Environmental Foundation of Santa Catarina, Brazil
FOC	Flag of Convenience
GAO	U.S. Government Accountability Office
GEF	Global Environment Facility
GIWA	Global International Waters Assessment
HELCOM	Baltic Marine Environment Protection Commission
IBAMA	Brazilian Institute of the Environment and Natural Renewable Resources
ICRAM	Central Institute of Marine Research
IEAPM	Admiral Paulo Moreira Sea Studies Institute
IGSS	Issue Group on Sustainable Shipping
IMO	International Maritime Organization
MCA	United Kingdom Maritime and Coastguard Agency

MMA	Brazilian Ministry of Environment
MT	Brazilian Ministry of Transportation
NANPCA	Nonindigenous Aquatic Nuisance Prevention and Control Act
NBIC	National Ballast Information Clearinghouse
NGO	Non-Governmental Organization
NISA	National Invasive Species Act
NOAA	U.S. National Oceanic and Atmospheric Administration
PNMA	Brazilian National Policy of Environment
SIBWC	Shipping Industry Ballast Water Coalition
SISNAMA	National Environment System of Brazil
UN	United Nations
UNCED	United Nations Conference on Environmental and Development
UNCHE	United Nations Conference on the Human Environment
UNCLOS	United Nations Convention on the Law of the Sea
UNDP	United Nations Development Programme
USCG	U.S. Coast Guard
WGAIS	Working Group on Aquatic Invasive Species
WGBOSV	Working Group on Ballast and Other Ship Vectors
WGITMO	Working Group on Introductions and Transfer of Marine Organisms
WHO	World Health Organization
WMF	World Merchant Fleet

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Chapter 1 Introduction

The maritime shipping business can be considered as one of the most significant industries in the world when taking into consideration that, in terms of weight, about 96% of the world trade is carried by sea.[1] The United Nations Conference on Trade and Development (UNCTAD) estimates that in 2006 the world seaborne trade (goods loaded) reached 7.4 billion tons and the global freight coasts represented 5.9% of the value of world imports.[2] Also, it has been estimated that the world's cargo carrying fleet is composed of 50,214 ships consisting of 687.9 million GT[3], who are registered in over 150 States, although just a small number of them control the greatest share of the world's gross tonnage.[4] However, despite the positive economic effect maritime shipping has on the world, it can also carries its weight in negative impacts regarding the environment.

Some of the potential negative impacts that ships have on the environment and economy include those related to the use of ballast water (Figure 1). In order to understand the need for a more structured and effective control of ballast water, it is important to be familiar with how the current situation is affecting the environment and humans. Regarding the environment, ballast water can transfer and introduce species that may affect the local ecological balance; as far as the human aspect is concerned, it may have an influence on the health of the population as well as their sources of income, and may impact the local, regional or even national economy.

[1] Jean-Paul Rodrigue and others, The Geography of Transport Systems. Chapter 3, Concept 4: Maritime Transportation. [book on-line] (Hofstra University, Department of Economics & Geography, New York, Routledge, 284 p. 2006); available on http://people.hofstra.edu/geotrans/eng/ch3en/conc3en/ch3c3en.html/; Internet; accessed 16 April 2007.
[2] UNCTAD, Review of Maritime Transport 2007. Report by the UNCTAD Secretariat, United Nations, New York and Geneva, 2007.
[3] Lloyd's Register Fairplay, World Fleet Statistics 2006. In: IMO. International Shipping and World Trade: Facts and Figures. Updated October 2007. IMO Library Services External Relations Office. p. 6, 2007.
[4] United Nations. General Assembly. Sixty-second session, Item 79 (a) of the provisional agenda. Oceans and Law of the Sea. Report of the Secretary-General. Addendum. A/62/66/Add.1, 31 August 2007. IV. Developments relating to international shipping activities. p. 17-20, 2007.

Figure 1. Ship discharging ballast water[5]

1.1 Background and Context

1.1.1 Definition of ballast water

Ballast water is normally taken on ships to compensate for the loss of weight stemming from unloaded cargoes and also due to significant consumption of fuel. It is water (salty, brackish, or fresh water) with its common suspended matter, necessary to manage the draft of ships, which helps their propulsion and maneuvers; control their trim,[6] list,[7] stability and keeps the levels of stress on their structure within acceptable limits.[8] Ships normally have many ballast tanks distributed throughout their structure and, if necessary, they also can use load bilges to carry ballast water. After ships take on ballast water, the suspended matter tend to sink and accumulate on the bottom of the ballast tanks forming layers of sediments constituted of organic and inorganic particles.

[5] Ballast water discharge in the Port of Itajaí (Santa Catarina, Brazil). Photo by Altevir Caron Jr.
[6] Trim: To shift ballast to make a ship change its position in the water. The difference between the forward draft and the after draft. In: Jeffrey W. Monroe and Robert J. Stewart, Dictionary of Maritime and Transportation Terms. Cornell Maritime Press. p. 391, 2005.
[7] List: An inclination to one side; a tilt. Refers to a condition in which a vessel is deeper on one side than the other due to loading, wind, or icing. The amount in degrees that a vessel tilts from the vertical. *Ibid*., p. 250.
[8] Committee on Ships'Ballast Operations, Marine Board, Commission on Engineering and Technical Systems, National Research Council. Stemming the Tide: Controlling Introductions of Nonindigenous Species by Ships' Ballast Water. National Academy of Sciences, 1996; and Article 1 (2) of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004.

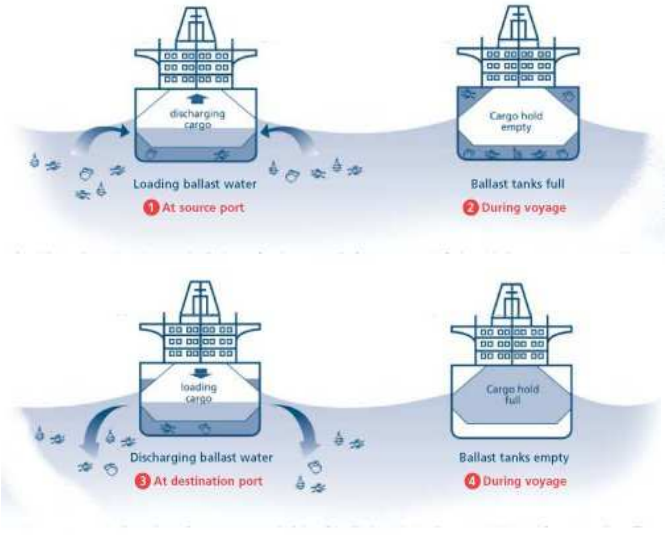

Figure 2. Cross section of ships showing ballast water cycle.[9]

Ballasting and deballasting operations are normally undertaken in ports or in areas adjacent to these, during the operations of loading cargoes (Figure 2) or fuel supplying, and its volumes can vary according to the "size of vessel, type of trade and shipping routes."[10] Tankers[11] and bulk[12] carriers[13] account for about 76% of the total ballast water volumes transported

[9] Source of the picture: GloBallast Website (http://globallast.imo.org). 1 – The ship is discharging cargo in some port while is loading ballast water with aquatic organisms. 2 – The ship is sailing without cargo but with its ballast tanks totally full. 3 – The ship is loading cargo while is discharging ballast water with alien species and/or pathogenic agents in the waters of the next port of call. 4 – The ship is sailing again, this time with cargo and without ballast water.

[10] Stephan Gollasch, Live to Win. In: CBD Technical Series nº 1. Assessment and management of alien species that threaten ecosystems, habitats and species. Secretariat of the Convention on Biological Diversity. Montreal 2001.

[11] Tankers: Ships specially constructed or converted to carry bulk liquid cargo: crude petroleum, petroleum product, and chemical tankers, LNG and LPG tankers, wine, molasses, and whaling tankers. Also, a ship for moving dry or liquid bulk commodities. The U.S. Census Bureau International Commerce data only refers to liquid bulk. In: Jeffrey W. Monroe and Robert J. Stewart, Dictionary, *op cit*. p. 375.

[12] Bulk: A mass of a product, unpackaged and generally homogeneous in nature. Bulk cargo consist of selected commodities that are normally shipped loose and in large quantities, which in the loading and unloading thereof are ordinarily shovelled, scooped, forked, or mechanically conveyed, and are not in packages, containers, or in units of such size to permit piece-by-piece handling, e.g., salt, gypsum, sugar, etc. Goods that are transported in large ocean going vessels; examples include salt, coal, petroleum, and grain. Petroleum carried in cargo tanks and not shipped in drums, containers, or packages. *Ibid*., p. 62-63, 2005.

[13] Bulk Carriers: Ships designed to carry dry bulk cargo. Category includes: ore/bulk/oil carries and other combination bulk/oil, and ore/oil carriers. *Ibid*., p. 63, 2005; Currently, some of the products that used to be shipped by bulk carriers have been transported also into containers, including sugar, wood, more valuable ores, and pig iron.

globally.[14] For instance, one ore carrier travelling in 1991 from Europe to Brazil may carry up to 120,000 MT of ballast water.[15] Europe, Japan, and U.S. (major consumers) would be the main export regions of ballast water by crude oil carriers, while the main importing regions would be the Middle East, the Caribbean and Africa (major exporters).[16] For bulk vessels, the most important export areas of ballast water would be Asia and Europe, while the importing regions would be North and South America, Australia and Asia.[17] Many studies have reported that the shipping industry is responsible for the global transfer of more than 10 billion tons of ballast water each year.[18]

1.1.2 The environmental concern of ballast water

As showed above, differently from other forms of marine pollution caused by ships, the negative impacts associated with ballast water occur due to a process inherent to their standard operational procedures.[19] Ballast water is recognized as the most important vector for trans-oceanic and inter-oceanic movements of shallow-water coastal organisms and the consequent introduction of alien and harmful organisms in the coastal zone waters.[20] The other main vectors, as outlined below in the Figure 3, include incrustations on the hulls of vessels and oil platforms, aquaculture, ornamental aquatic organisms, canal openings, and watercourses transposition.

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[14] More specifically 37% oil tankers + 39% bulk carriers. In: Øyvind Endresen *et al*, Challenges in global ballast water management. Marine Pollution Bulletin, v. 48, p. 615-623, 2004.

[15] James T. Carlton, *et al*, Shipping Study: The role of shipping in the introduction of non-indigenous aquatic organisms to the coastal waters of the United States (other than the Great Lakes) and an analysis of control options. The National Sea Grant College Program/Connecticut Sea Grant Project R/ES-6. Department of Transportation, United States Coast Guard, Washington, D.C. and Groton, Connecticut. Final Report, nº CG-D-11-95, p. xvii, 1995.

[16] Øyvind Endresen *et al*, Challenges in, *op cit*. p. 616.

[17] *Ibid*. Fearnleys, World Bulk Trades (2000).

[18] G.R. Rigby *et al*, Novel ballast water heating technique offers cost-effective treatment to reduce the risk of global transport of harmful marine organisms. Marine Ecology Progress Series, v. 191, p. 289-293, 1999; Carlos Francisco S. Gomes, Using MCDA methods THOR in an application for outranking the ballast water management options. Pesquisa Operacional, v. 25, nº 1, p. 11-28, 2005; Stephan Gollasch, Ballast Water Management in the North-East Atlantic. Report to aid decision making on Ballast Water in OSPAR BDC, 2002; etc.

[19] Alexandre de C. Leal Neto, Identificando similaridades: Uma aplicação para a avaliação de risco de água de lastro, Doctorate Thesis, Federal University of Rio de Janeiro (UFRJ), COPPE, p. 140, 2007.

[20] IUCN Guidelines for the Prevention of Biodiversity Loss Caused by Alien Invasive Species. Information Paper of Fifth Meeting of the Conference of the Parties to the Convention on Biological Diversity. Nairobi, Kenya, 2000; Maria Monia Flagella and Ameer A.Abdulla. Ship Ballast Water as a Main Vector of Marine Introductions in the Mediterranean Sea. WMU Journal of Maritime Affairs, v. 4, nº.1, p. 95-104, 2005.

Figure 3. Common marine bioinvasion vectors[21]

It has been estimated that more than 10,000 different species of aquatic microbes, plants and animals may be carried globally in ballast water each day.[22] Any organisms that can pass

[21] Source of the picture: James T. Carlton. Introduced Species in U.S. Coastal Waters: Environmental Impacts and Management Priorities. Prepared for the Pew Oceans Commission. Williams College and Mystic Seaport. p. 10, 2001.

[22] UNDP, Building Partnerships to Assist Developing Countries to Reduce the Transfer of Harmful Aquatic Organisms in Ships' Ballast Water (GloBallast Partnerships). UNDP Project Document, p. 1, 2007. Available on

through the ships ballast water system can be transfer between different port areas. This includes bacteria and other microbes, viruses, small invertebrates, eggs, cysts and larvae of various animals and plants. Some living fish have also been found in ballast tanks.[23] Nevertheless, although shipping seems to currently be the main invasion vector as it includes both ballast water and hull fouling,[24] the relative importance of invasion vectors may vary according their economic significance in different countries or regions (Table 1).

Table 1. Estimated relative importance of vectors of biological invasions[25]

Country/region	Relative vector importance (%)				
	Non-shipping Vectors*	Aquaculture	Shipping	Ballast Water	Hull Fouling
Australia, Port Phillip Bay					77
Baltic Sea		14	48		
Belgium		33		33	33
Canada Pacific			Majority		
Canada, Atlantic			Majority		
Canada, Great Lakes				Majority	
Croatia				38	62
Germany				50	50
Greece	75		25		
Italy	18**	19		20	50
Norway	33	33	33		
Spain		16			
Sweden				Majority	
The Netherlands		21		10	28
UK		40	53	18	24
USA, New England States		4		28	45
USA, San Francisco Bay		22		24	26

* Includes movements of species with fishing gear; ** Via the Strait of Gibraltar and the Suez Canal, a process called "Lessepsian migration"[26].

http://www.gefweb.org/uploadedFiles/Documents/Council_Documents__(PDF_DOC)/GEF_31/Globallast__ProDoc_23%20April%20final.pdf/; accessed 30 November 2007.

[23] Dandu Pughuic. Ballast Water Management and Control: An Overview. GloBallast Project Coordination Unit, IMO, p. 42, 2001.

[24] Stephan Gollasch, Is Ballast Water a Major Dispersal Mechanism for Marine Organisms? In Biological Invasions, Ecological Studies, W. Nentwig Ed., Springer-Verlag Berlin Heidelberg Publisher, v. 193, p. 55, 2007.

[25] Table extracted from: ICES Advisory Committee on the Marine Environment. ICES WGBOSV Report 2006: Report of the ICES/ IOC/ IMO Working Group on Ballast and Other Ship Vectors (WGBOSV), Oostende, Belgium, p.21, 2006.

[26] The terms "Lessepsian" or "Erythrean" refer to species that crossed the Suez Canal from the Red Sea into the Mediterranean Sea. In Maria Monia Flagella and Ameer A. Abdulla, Ship Ballast Water, *op cit.* p. 97.

Where members of a species occur outside their normal distribution, they are considered to be alien in this new location.[27] Alternate terms used to describe these species are non-indigenous, non-native, exotic, foreign, new and pest. The IUCN Guidelines on Biological Invasions defined alien species as:

> species, subspecies, or lower taxon occurring outside of its natural range (past or present) and dispersal potential (i.e. outside the range it occupies naturally or could not occupy without direct or indirect introduction or care by humans) and includes any part, gametes or propagule of such species that might survive and subsequently reproduce.[28]

Historically, the first scientific recognition of an alien species introduction occurred in 1903, after a mass occurrence of the Asian phytoplankton algae Odontella (*Biddulphia sinensis*, Greville 1866) in the North Sea.[29] Currently, the introduction of marine invasive species into new environments via ships ballast water as well as other media has been identified by the Global Environment Facility (GEF) as one of the four biggest threats to the world's oceans.[30] The other three threats include overexploitation of living marine resources, physical alteration or destruction of marine habitats, and marine pollution that also can be a consequence of discharges of ballast water which originates from port areas contaminated by organic compounds, heavy metals, nutrients, oil and other toxic substances. Global climate changes, and changes in atmospheric composition, are also identified as a fifth threat to the world's oceans.[31]

However, despite the huge volume of ballast water carried on ships, the vast majority of aquatic species cannot survive to the journey due to the stress of ballasting and deballasting operations and the lack of light and food inside ballast tanks. Although these adverse factors may exist, organisms can establish temporary or permanent communities in the water column or in the sediments accumulate in the bottom of the ballast tanks, making possible the

[27] Clare Shine *et al*, A guide to designing legal and institutional frameworks on alien invasive species. IUCN Environmental Law Centre. A Contribution to the Global Invasive Species Programme. The World Conservation Union, Environmental Policy and Law Paper, n° 40, p. 7, 2000.
[28] Ibid., p. 117.
[29] According the United Nations Atlas of the Oceans website, available on http://www.oceansatlas.com/; accessed 15 September 2007.
[30] Ed. Steve Raaymakers and Christine Gregory, 1st East Asia Regional Workshop on Ballast Water Control and Management. GloBallast Monograph Series n° 6, Workshop Report, Beijing, China, 2002.
[31] Maria Monia Flagella and Ameer A. Abdulla, Ship Ballast Water, *op cit*. p. 96.

subsequent release of the same alien species in different ports of the route of the ships.[32] Moreover, with the development of the naval engineering technology, the use of new bigger and faster ships increase the volumes of ballast water transported and reduces the time of the journeys, both of which contribute for increasing the survival chances of the organisms and favor ballast water-mediated introductions.[33] As discussed below, the ports present several characteristics that favor the success of invasions.

1.1.3 The port aspects involved

Ports and harbors are potential hotspots for marine invasive species because activities that can transport and potentially introduce new species are concentrated in these areas, including ballast water exchange, hull cleaning, bait and seafood transport, and boat travel.[34] Most of the Brazilian ports, as well as many other in diverse parts of the world, are very old and were constructed in sheltered coastal environments such as bays and estuaries. Currently, these environments are located within or near large urban areas, and are usually degraded and eutrophicated, especially due to landings or other physical modifications of the shoreline, and the introduction of urban and industrial effluents and residues, including those deriving directly from port activities (Figure 4).

[32] Ministério do Meio Ambiente and Train-Sea-Coast Brasil. Gerenciamento de Água de Lastro. (Submódulo 3.5) Qualidade Ambiental e Atividade Portuária no Brasil, PNCAP. Programa Train-Sea-Coast Brasil FURG/CIRM/ONU, Vitória/ES, 33 pp., 2006.

[33] Stephan Gollasch, Is Ballast Water a Major Dispersal Mechanism for Marine Organisms? In Biological Invasions, Ecological Studies, W. Nentwig Ed., Springer-Verlag Berlin Heidelberg Publisher, v. 193, p. 55, 2007.

[34] Tracy Hart *et al*, Maine's Marine Invasion. Fact sheet produced by the Maine Sea Grant College Program in coordination with the Maine Marine Invasive Species Working Group. Available on http://www.seagrant.umaine.edu/documents/pdf/MMI05.pdf/; accessed 23 April 2007.

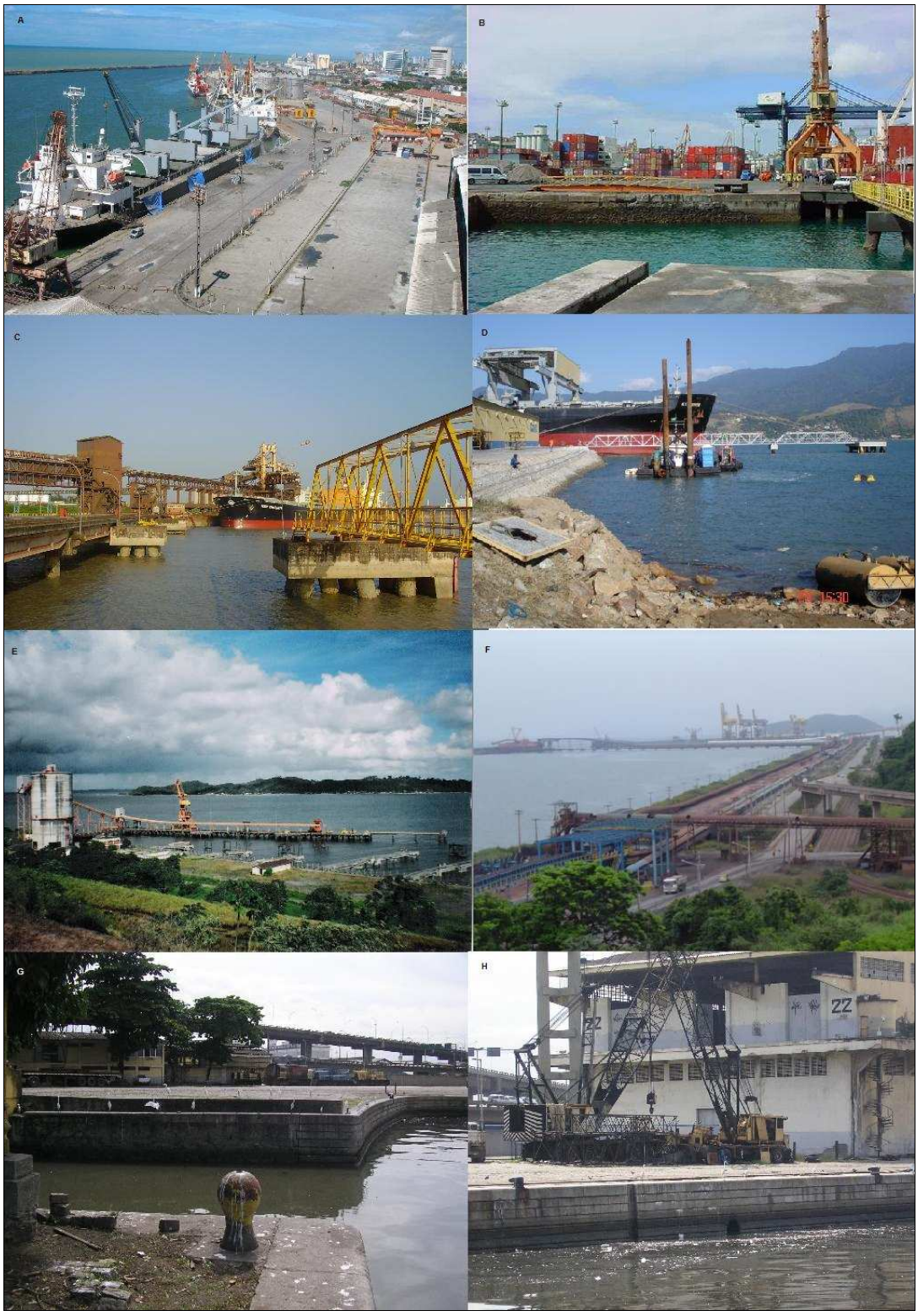

Figure 4. Examples of port areas in Brazil[35]

[35] Pictures from ANTAQ's Management of Environment archive. A – Port of Recife; B – Port of Salvador; C – Port of Itaqui; D – Port of São Sebastião; E – Port of Aratu; F – Port of Itaguaí (Sepetiba); G and H – Sources of eutrophication in the Port of Rio de Janeiro.

It has been found that environmental pollution and habitat destruction can provide conditions that favor alien invasive species;[36] and that urban-industrial areas, habitats suffering from periodic disturbance, harbors, lagoons, estuaries and the fringes of water bodies, where the effects of natural and anthropogenic disturbances are often linked, are also particularly vulnerable to invasions.[37] Moreover, the existence of hard substrata such as coastal engineering structures commonly built for creating artificial sheltered areas for ships in ports could increase the dispersal of invasive species across regional and geographic scales.[38] Hence, the following conditions, all of them easily found in ports, can facilitate the establishment of alien species in new environments:[39]

- Matching climate, salinity and habitat structure;
- "Ecological niche" (microhabitat) available;
- Absence of competing organisms for resources, predators, grazers and/or parasites in recipient area;
- Strong anthropogenic influence (pollution, power plants, aquaculture systems, artificial hard substrates, periodical dredging activities);
- Low number of native species; and
- Sheltered environments (embayments, harbors and estuaries are probably more open for invasions than habitats of the outer coast).

In States whose sanitation systems and urban effluent treatment facilities are deficient or do not exist, the waters of the port areas can present physical and chemical characteristics that favor ecologically opportunist species and even organisms harmful to human health. In fact, the IMO as well as the World Health Organization (WHO) recognized that the ballast water

[36] IUCN, IUCN Guidelines for the Prevention of Biodiversity Loss Caused by Alien Invasive Species. Information Paper of Fifth Meeting of the Conference of the Parties to the Convention on Biological Diversity. Nairobi, Kenya, 21 pp., 2000.

[37] Kowarik, I., Neophytes in Germany: quantitative overview, introduction and dispersal pathways, ecological consequences and open questions. In: McNeely, J.A. *et al*, A Global Strategy on Invasive Alien Species. IUCN Gland, Switzerland, and Cambridge, UK, p. 22, 2001.

[38] ICES, Report of the Working Group on Introductions and Transfers of Marine Organisms (WGITMO), Dubrovnik, Croatia. International Council for the Exploration of the Sea - ICES CM 2007/ACME:05, p. 80, 2007.

[39] Stephan Gollasch and Erkki Leppäkoski, Initial Risk Assessment of Alien Species in Nordic Coastal Waters. Nordic Council of Ministers, Copenhagen, p. 55, 1999.

can not only cause ecological problems, but can also be a vector of pathogenic agents of epidemic diseases.[40] In 2002, the National Health Surveillance Agency of Brazil (ANVISA) undertook an exploratory study to identify and characterize pathogenic agents in ballast water in nine Brazilian ports.[41] According this study, all microbiological indicators were detected, and the "results proved the presence of cultivable marine bacteria in 71% of the ballast water samples analyzed, varying from 1,000 up to 5.4 million bacteria per liter of sample." [42]

1.1.4 Introduction of alien species

When ships arrive in ports where goods will be loaded, together with the ballast water they also unload organisms that survived to the journey. The introduction to a new environment causes again a great stress to these organisms and many of them do not survive this last phase of their transfer. However, as was previously verified, depending on the environmental characteristics of the port area, the alien species released may survive, grow, reproduce and interact negatively with native species, preying on them or competing with them for food resources and/or space. The increase in the similarities of the environmental characteristics between the new port and the port of origin creates greater chances of survival and establishment for the organisms transported by ballast water. This approach would be even more important for those aquatic invasive species not capable to tolerating variations in environmental parameters, for example salinity and temperature.[43]

If an alien species became established in natural or semi-natural ecosystems or habitats, is an agent of change[44] since it starts to occupy a place and play a new role in the local food chain, which can be sufficient to alter the previous characteristics of other species populations, affect the ecosystem balance, and consequently threaten the biological diversity. In this case they are classified as "alien invasive species" as they not only persist but proliferate and

[40] IMO, Resolution A.868 (20): Guidelines for the Control and Management of Ships' Ballast Water to Minimize the Transfer of Harmful Aquatic Organisms and Pathogens. p. 5, 1997.
[41] ANVISA, Brazil Ballast Water. Brazilian Sanitary Surveillance Agency - GGPAF Projects 2002, 9 pp., 2003. Available on http://www.anvisa.gov.br/eng/pab/ballast_water3.pdf/; accessed 15 may 2007.
[42] *Ibid*. p. 4. The indicators identified by the study of ANVISA were: vibrios, fecal coliforms, *Escherichia coli*, enterocci fecal, *Clostridium perfringens*, coliphages, *Vibrio cholerae* O1, and *Vibrio cholerae* non-O1. Also, 12 strains had been found in 7 samples of ballast water, being identified as *Vibrio cholerae* O1 EL TOR, two of them were toxicogenic.
[43] Alexandre de C. Leal Neto, Identificando similaridades, *op cit*. p. 30.
[44] Clare Shine *et al*, A guide to designing, *op cit*. p. 2.

spread beyond defined limits.[45] Many worldwide examples of biological invasions have caused serious ecological, economical, social and health consequences to the country or region where the alien species have been introduced. Considering the economic impacts, including through disruption to fisheries, fouling of coastal industry and infra-structure and interference with human amenity, it is estimated that invasive aquatic species cause some US $100 billion in damages per year.[46] More detailed examples of alien species introductions and their respective impacts are provided in Annex 1.

1.1.5 Ballast water management regulations

In response to this problem, in 1991 the IMO began to discuss the adoption of international guidelines for the management of the ballast water. After the adoption of some previous resolutions in the nineties,[47] in 2004 the IMO's "International Convention for the Control and Management of Ships' Ballast Water and Sediments" was finally elaborated.[48] In Brazil, some provisions of this international Ballast Water Management Convention (BWMC) were internalized in the form of a federal norm: NORMAM-20 – Norm of the Maritime Authority for the Management of the Ballast Water of Ships.[49] This norm provides the general guidelines for ballast water exchange, one of the most important measures adopted in the BWMC. In basic terms, ships must exchange the ballast water at least 200 nautical miles (nm) from the shoreline, at least at 200 meters of depth, and with efficiency of at least 95% of volumetric exchange of the ballast water.[50] Currently, the ballast water exchange is the most important measure, sometimes the single one, adopted in countries for ballast water management (BWM) because is believed that, if correctly applied, it could significantly reduce the risks of

[45] *Ibid*.
[46] UNDP, Building Partnerships, *op cit*. p. 1.
[47] MEPC Resolution 50(31) - Guidelines for Preventing the Introduction of Unwanted Organisms and Pathogens from Ships' Ballast Water and Sediment Discharges (1991); Resolution A.774(18) - Guidelines for Preventing the Introduction of Unwanted Organisms and Pathogens from Ships' Ballast Water and Sediment Discharges (1993); and Resolution A.868 (20): Guidelines for the control and management of ships' ballast water, to minimise the transfer of harmful aquatic organisms and pathogens (1997).
[48] International Maritime Organization, International convention for the control and management of ships' ballast water and sediments, 2004. In International conference on ballast water management for ships, London, 2004.
[49] Brasil, Portaria nº 52/DPC, 2005. Norma da Autoridade Marítima para o gerenciamento da água de lastro de navios. Diretoria de Portos e Costas (DPC), Marinha do Brasil. Diário Oficial da União nº 121 (27/06/2005), Poder Executivo, 2005.
[50] Text of the Regulation B-4 (Ballast Water Exchange) and Regulation D-1 (Ballast Water Exchange Standard) of the BWMC. The BWMC has also some specific conditions for situations that obstruct the complete performance of the ballast water exchange. These exceptions are described in advance.

alien species invasions due to the fact that the near-coastal (including port and estuarine) organisms probably would not survive in open sea waters and vice-versa.

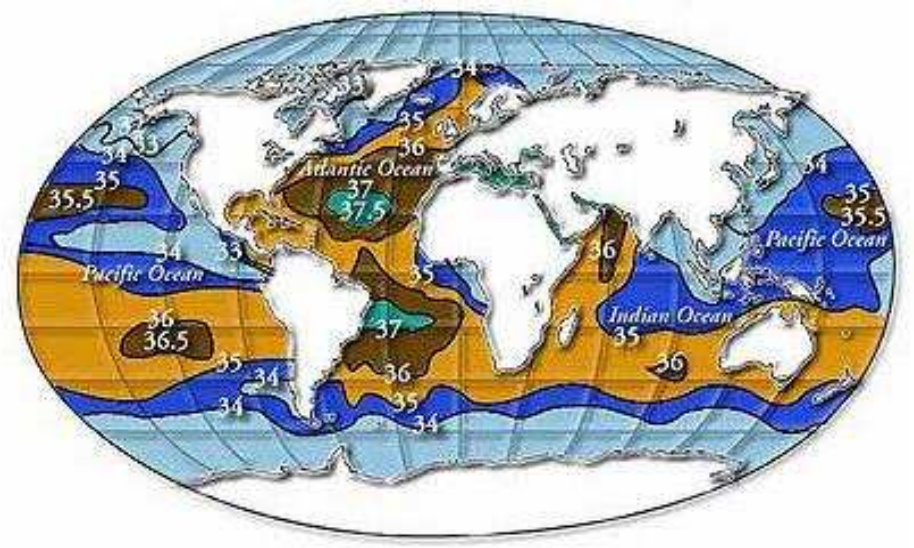

Figure 5. World Sea Surface Salinity (SSS) values[51]

However, the ballast water exchange in open sea is not a simple operation and could affect the structure of ships and offer risks to their security. This because ships have not been built to execute this kind of procedure. Despite the requirements of NORMAM-20, it was found through ANVISA's study that in Brazil 62% of the sampled ships whose captains claimed to have carried out deep-sea ballast water exchange in compliance with IMO guidelines had probably not done so, or done so only partially, since they had ballast water with salinity lower than 35 (practical salinity units).[52] Moreover, some scientific studies have proven that the

[51] Source: NASA, The Science Mission Directorate Website (NASA / science@nasa / Oceanography / Physical); available from http://science.hq.nasa.gov/oceans/physical/SSS.html/; accessed 30 November 2007.

[52] The practical salinity unit is used to describe the concentration of salts in water (UNESCO 1978) and it is dimensionless. Previously, salinity was expressed in parts per thousand (ppt or ‰), which correspond the amount of salt (in grams for instance) found in 1,000 grams of water (this unit is still used in some studies). In Brazil, according Article 2 of the CONAMA Resolution N° 357/2005, fresh water salinity is ≤ 0.5; brackish water salinity is > 0.5 and < 30; and salty water salinity is ≥ 30. The average sea surface salinity (SSS) is 35, but in open ocean waters the salinity can vary globally between 32 and 37.5, while in coastal waters the salinity is usually lower due higher precipitation and continental fresh water input. In theory, considering that the SSS of open ocean waters along the Brazilian coast (tropical and subtropical areas) ranges between 35 and 37 (Figure 5), the ballast water salinity of ships that have reported compliance with the ballast water exchange requirement must be at least 35 when they reach Brazilian ports. Thus, discharges of ballast water whose salinity is less than 35 would indicate that the ship did not perform the exchange properly. However, just checking the ballast water salinity may not be sufficient to guarantee that the oceanic exchange was really performed. Some offshore ports and terminals, or even some ports located inside bays with little continental fresh water input, may perennially or seasonally present waters with salinity similar to oceanic waters (≥ 35). Thus, the captain of a ship that has taken

ballast water exchange should be considered just as an interim solution due its limited effectiveness.[53]

Regarding measures that can be taken in ports, the BWMC prescribes the utilization of onshore reception and treatment facilities for ballast water.[54] However, in accordance with a study developed in Brazil for the Port of Suape,[55] which is one of the very few Brazilian ports with sufficient available space for building these facilities, this measure would demand great investments resulting in high port tariffs to compensate the costs of construction and maintenance of the structure, and of ballast water treatment. It is estimate that the cost for ballast water treatment on land would be between 1.4 and 8.3 dollar for ton,[56] while the cost of the exchange operation in open sea would be between 0.02 and 0.05 dollar per ton of ballast water.[57] Other obstacles towards building and using these types of facilities include the lack of space to locate them in most Brazilian ports and the delay that ballast discharge would cause in the ships' operation. Moreover, the BWMC also established a time limit[58] for the ships to make the necessary adaptations to implement its standards for ballast water management.[59] Furthermore, retrofitting of existing ships and new standards of construction for ships enable safe and efficient ballast water exchange, and will quickly render treatment facilities obsolete.

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ballast water in a port like these, in possession of such information on the salinity of the ballast water and also knowing that at the next port of call the ballast water control is made only through checking this parameter, may simply decide not to do the oceanic exchange to avoid the associated costs. Moreover, considering that the original ballast water salinity is already 35, the exchange may not have the same efficiency for reducing the risks of biological invasions since the organisms present in ballast water would not suffer a saline shock during the procedure. In fact, many estuarine and marine coastal organisms are eurialine, which means that they can support variations on the water salinity when it happens gradually as during the ballast water exchange performed through the dilution or flow-through methods. Therefore, considering that at least 5% of the original waters and organisms would be kept in the ballast tanks after the exchange, this could be enough to transfer alien species.

[53] ICES, Report of the ICES/IOC/IMO Working Group on Ballast and Other Ship Vectors (WGBOSV), Oostende, Belgium . ACME:06. p. 13, 2006.

[54] According to Regulation B-3.6 of the BWMC, the requirements of ballast water management standards do not apply to ships that discharge ballast water to a reception facility designed taking into account the Guidelines developed by the Organization for such facilities. These guidelines were adopted on 13 October 2006 through Resolution MEPC.153(55): Guidelines for Ballast Water Reception Facilities (G5).

[55] Luciola Perez de Almeida and Alexandre de Carvalho Leal Neto, Convenção internacional para controle e gestão de água de lastro: Conseqüências para o porto de Suape. 5º Seminário sobre Meio Ambiente Marinho. Sociedade Brasileira de Engenharia Naval. Rio de Janeiro, 8 pp., 2005.

[56] State Water Resources Control Board - California Environmental Protection Agency. "Evaluation of Ballast Water Treatment Technology for Control of Nonindigenous Aquatic Organisms". December 2002. Available on http://www.calepa.ca.gov/Publications/Reports/Mandated/2002/BallastWater.pdf/; accessed 15 June 2007.

[57] UNDP, Building Partnerships, *op cit*. p. 54.

[58] Regulation B-3 (Ballast Water Management for Ships) of the BWMC. These limits vary according the ballast capacity and the construction date of the ships, as showed in Table 3.

[59] Regulation D-1 (Ballast Water Exchange Standard) and Regulation D-2 (Ballast Water Performance Standard) of the BWC, as explained in the following pages.

In fact, it is clear that greater investments should be made on the ships that have not yet met the standards, rather than in the construction of onshore treatment facilities. Therefore, costs are significantly decreased for the port States and the objective of having ships undertake the exchange and treatment of ballast water is reached faster.

In January 2006, diverse Brazilian Governmental and private institutions involved with all aspects of port activities and maritime transport discussed proposals for two federal bills regarding ballast water management.[60] These projects intended to prescribe a controversial obligation for organized ports and port facilities to have an adequate structure or means for collecting and analyzing samples of ballast water according to criteria established by the environmental and health agencies.[61] The debate concluded that the bills were unfeasible and not compatible with the legal attributions of each authority implicated, which are the Maritime, the Environmental, the Sanitary and the Port Authorities. The main reasons for this rejection of the bills are detailed below. Thus, in January 2007, the bills were shelved by the Brazilian Chamber of Deputies, the federal legislative body of Brazil. However, another bill is currently being discussed by the Brazilian Deputies concerning to the mandatory presence of ballast water inspections on ships that use the Brazilian ports.[62]

Generally, these new bills bring the same requirements of the two previous bills, including the adoption of adequate means for collecting and analyzing samples of ballast water in ports. The persistence to approve bills that better regulate the national ballast water management was justified by its author[63] taking into account the premise that neither the methods for collecting, analyzing and treating ballast water developed by different national and international institutions nor did Brazil ratify the BWMC would be helpful if the implementation of such methods depend only on the voluntary initiative of the less interested side, which is the shipping industry. The main goal of the draft bill would be to provide competent authorities (Port, Sanitary and Environmental) with the necessary tools to perform active inspections on ships, ensuring public health and the maintenance of the balance aquatic ecosystems while enforcing the provisions of the BWMC.

[60] Projeto de Lei (PL) nº 5263/2005 on compulsory inspection of ballast water of ships that use national ports; and PL nº 6260/2005 on compulsory inspection, treatment and definition of ballast water of ships that use national ports.
[61] Article 4 of both PL nº 5263/2005 and PL nº 6260/2005.
[62] PL nº 954/2007 on compulsory inspection of ballast water of ships that use national ports.
[63] Deputy Valdir Colatto.

However, considering an apparent wish to keep NORMAM-20 as the only legal instrument directly regulating the ballast water management until Brazil ratifies the BWMC, these new bills will certainly have the same destiny as their predecessors. Indeed, the first step in this direction has been taken through a report[64] of the Commission of Traffic and Transportation of the Chamber of Deputies that once again rejected both draft bills on the grounds that a new legislation regulating such matters would not be needed as debates within the IMO would achieve effective results with the adoption of the BWMC. The report also concludes that legislative efforts should be made just to accelerate the process of the BWMC ratification by Brazil, despite that the provisions of the BWMC calls on states to develop national policies strategies or programs for BWM in its ports and waters under its jurisdictions,[65] this with due regard to their particular conditions and capabilities.

1.2 Scope and Objectives

The management of Brazilian port areas, including all sea-based and land-based port facilities, is the mandate of the local port authorities.[66] It is also the duty of the port authority to inspect the port operations, ensuring that services occur with regularity, efficiency, security and respect the environment.[67] Moreover, as the legal entities responsible for ports administration, the port authorities have also the liability for taking care and establishing measures for environmental control of the organized port areas.[68] The great majority of these programs and measures are prescribed by legislation and applied through the process of "environmental licensing" of ports, led by federal or state environmental agencies of the National Environment System (SISNAMA).

[64] Deputy Décio Nery de Lima. Report on the PL nº 954/2007. Commission of Traffic and Transportation of the Chamber of Deputies (Comissão de Viação e Transporte a Câmara dos Deputados), 2007. Available on http://www.camara.gov.br/sileg/integras/522101.pdf/; accessed 21 December 2007.
[65] Article 4 of the BWMC.
[66] Article 1 (Paragraph 1 - IV) of Brazilian Federal Law nº 8630/1993 (Law of the Ports).
[67] Article 33 (Paragraph 1 - VII) of the Section II of Chapter VI of Brazilian Federal Law nº 8630/1993 (Law of the Ports).
[68] Article 225 (Paragraph 4) of the Brazilian Federal Constitution (1988); Article 1 (II) of the CONAMA Resolution nº 237/1997; Article 7 of the Federal Law nº 9966/2000; CONAMA Resolution nº 293/2001; Article 2 (Paragraph 3 - VI) of the Federal Decree nº 4391/2002; Article 34 of the Federal Decree nº 4340/2002; Article 44 (VII) of the ANTAQ Resolution nº 55/2002; Article 16 of the Federal Decree nº 5300/2004; CONAMA Resolution nº 344/2004; Article 8 (Paragraph 5) of the CONAMA Resolution nº 357/2005; Item 29.1.4.4 of the NR 29; and many other State and municipal legislation.

In Brazil, depending on its localization and the reach of its environmental impacts, the ports can be licensed by the federal agency or by the state agencies. Due to the inexistence of a specific and standard national rule for port environmental licensing, often the requirements made by the environmental agencies are not exactly the same for all Brazilian ports. Thus, measures related to the BWM can be required for some port authorities and not required for others. These differences in requirements made by the various Brazilian environmental agencies result in distinct and unbalanced costs for each port resulting in different port tariffs. Those ports that invest more in environmental control can be wronged; therefore in order to save money, ships might choose to go to ports that have more lax rules for environmental treatment.

This obviously becomes a problem and increases the need to create a national set of rules and regulations applied to all ports. Considering this reality and the current inefficiency of the measures adopted in Brazil to effectively reduce and control the risks associated with ballast water, the main objective of this study is to review and outline the approach necessary for the development and implementation of a "ballast water management plan" by Brazilian ports. This plan certainly would not solve all the concerns related to this issue, but it could serve to reinforce the implementation of the BWMC and aid in the process of adoption of more standardized measures in Brazilian ports through a national regulation of requirements made in the scope of the environmental licensing of ports.

Currently, a working group is elaborating a proposal for a resolution of the National Environment Council (CONAMA) entitled "Introduction, Reintroduction and Translocation of Exotic Species in Aquatic Environments."[69] The CONAMA is the consultative and deliberative body of SISNAMA, and has representation of all segments of Brazilian society: federal, state and local government, non-governmental organizations (NGO), industry, and independent experts. The present study considers ballast water as a source of alien species and proposes that this fact be included in the provisions of the above mentioned proposal of resolution, or be discussed by another CONAMA working group to be created specifically for improving the regulation of environmental licensing of ports.

[69] Webpage of CONAMA's working group: http://www.mma.gov.br/port/conama/ctgt/gt.cfm?cod_gt=126/

Considering that ballast water not only concerns shipping, but that in fact it is also one of the main issues of environmental management of ports as its impacts originate mostly in port areas, the main objective of the present work is to analyze the efficacy and convenience of the current strategy adopted by Brazil with respect to ballast water and how it could be improved through addressing it through the environmental licensing of ports.

The ideal approach would be the adoption of a specific plan or program that rationalizes the implementation of the actual requirements for port authorities in the framework of their environmental licensing. This plan shall recommend practical and feasible actions and/or measures to be implemented and led by the port authorities and reported to the institution mandated with the national management of ballast water. Therefore, through this plan, port authorities could be able to contribute in a more standardized and effective manner in minimizing the risks of the introduction of alien species and pathogenic agents in Brazilian ports and their transfer abroad. This study is based on Article 4 of the BWMC, which states:

> Each Party shall, with due regard to its particular conditions and capabilities, develop national policies, strategies or programmes for Ballast Water Management in its ports and waters under its jurisdiction that accord with, and promote the attainment of the objectives of this Convention.

The measures prescribed by the BWMC currently surpass the actual requirements adopted in Brazil, where the control of the risks related to ballast water only depend on its uncertain exchange beyond 200 nm of the coast and on insufficient inspections of ships. In addition to the study undertaken by ANVISA, other studies listed below also indicate that a great number of vessels have not properly complied with this requirement and the institutions responsible for undertaking inspections on ships do not possess the necessary resources.

More specifically, the present study aims to:

- Provide an overview of the current recommendations and obligations established by the International Maritime Organization for the issue;
- Describe how the subject is currently treated in Brazil, including the review of national legislations, institutions, and limitations of the current approaches;
- Compare the legal requirements and procedures for BWM adopted in United States and European States with the Brazilian procedures, and extract best practices which could be used in the proposed ballast water management plan for ports in Brazil; and

- Review the possibility of establishing standardized procedures for environmental licensing of ports and terminals in Brazil, and determine which criteria for BWM should be considered by Governmental environmental institutions during the environmental licensing procedures.

Through the above, the present study also aims to contribute to the formulation of standardized approaches and norms in the field of Brazilian BWM. This aspect is of particular importance to the proper national implementation of the BWMC by the Brazilian authorities and stakeholders.

1.3 Overview of Report

In addition to this introductory Chapter 1, this report contains five chapters. Chapter 2 presents an overview of the international regulatory framework, relating the most important provisions of international agreements and conventions involving shipping activities and the promotion of marine environment protection that could be addressed to ballast water management. Chapter 3 and 4 summarize the approaches to ballast water management respectively adopted by the U.S. and the European Union (EU), outlining the measures or strategies that could be applied or serve as reference for the improvement of the Brazilian approach.

Chapter 5 is the central chapter of this study. It describes and comments on the Brazilian coastal zone, port and waterways systems, the role of the Governmental institutions related with environmental and economic aspects of port and shipping activities, and the national legislation that regulates the current BWM in Brazil. Moreover, Chapter 5 presents and discusses the environmental licensing process and its potential to improve the Brazilian BWM without prejudice to the provisions of the BWMC. Chapter 6 concludes the study by summarizing the conclusions and recommendations, as well as outlining the need for additional studies for accomplishing the objectives mentioned above.

Chapter 2 International Regulatory Framework

This chapter presents the main provisions adopted by the international agreements and conventions that best address the aspects connecting shipping activities and the promotion of marine environment protection, which in turn refers the urgent need for States to adopt measures for ballast water management. Hence, this chapter chronologically delineates the evolution of the subject through the major international treaties that have provisions directly or indirectly applicable to BWM.

2.1 The United Nations Conference on the Human Environment (Stockholm, 1972)

The United Nations Conference on the Human Environment (UNCHE) was the first large international event organized specifically to analyze and discuss the adoption of correct environmental practices to promote human development in a more environmentally conscious society. This Conference counted the participation of representatives from 113 States, as well as representatives of numerous international nongovernmental organizations, observers from a number of intergovernmental organizations, and by representatives of many UN specialized agencies. Although ballast water was not specifically mentioned in the scope of the Conference as a source of marine pollution, recommendations for applicable actions that can address its management were developed in the Action Plan for the Human Environment,[70] as the Recommendation 92 (a) that calls on Governments to:

> take early action to adopt effective national measures for the control of all significant sources of marine pollution [...] and concert and coordinate their actions regionally and where appropriate on a wider international basis [and] collectively endorse [...] the statement of objectives agreed on at the second session of the Intergovernmental Working Group on Marine Pollution, which reads as follows:
>
> The marine environment and all the living organisms which it supports are of vital importance to humanity, and all people have an interest in assuring that this environment is so managed that its quality and resources are not impaired. This applies especially to coastal nations, which have a particular interest in the management of coastal area resources. The capacity of the sea to assimilate

[70] Report of the United Nations Conference on the Human Environment. Action Taken by the Conference. Action Plan for the Human Environment, Recommendations for action at the international level. Identification and control of pollution of broad international significance: B - Marine Pollution.

> wastes and render them harmless and its ability to regenerate natural resources are not unlimited. Proper management is required and measures to prevent and control marine pollution must be regarded as an essential element in this management of the oceans and seas and their natural resources.

Another action of the UNCHE was the formulation of the Declaration of the United Nations Conference on the Human Environment,[71] which enumerated a series of common principles to be followed by the peoples of the world for preserving and enhancing the human environment, including one which relates to the impacts caused by ballast water:

> States shall take all possible steps to prevent pollution of the seas by substances that are liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea.[72]

Thus, it is reasonable to consider that, at that time, the States were encouraged to adopt measures for preventing marine pollution that should have also considered the ships' ballast water since its discharge can be the cause of many environmental, economical, and social impacts that hazard human health, harm living resources and marine life, damage amenities and interfere with other legitimate uses of the sea. Consequently, there is no doubt that, in addition to oil spills, atmospheric emissions, sewage, and garbage, ballast water is another way ships pollute the marine environment. This happens not only when ballast water is contaminated by chemical (oil and derived compounds, and other chemical substances in industrial effluents) or organic compounds (urban effluents with nutrients and organic matter), but also when it introduces alien species or pathogenic agents in aquatic environments, or when presents physical characteristics (including salinity, temperature, transparence, turbidity, and pH) significantly different from those of the receptor water body and thereby causes negative environmental effects when discharged, which normally occurs in great volumes.

Ballast water is also addressed through the provisions of the MARPOL Convention (1973), an international agreement specifically aiming to reduce marine pollution from ships; and as

[71] The United Nations Conference on the Human Environment, Chapter 11: Declaration of the United Nations Conference on the Human Environment, adopted by the 21st plenary meeting on 16 June 1972.
[72] Principle 7 of the Declaration of the United Nations Conference on the Human Environment.

outlined below, the idea of ballast water causing marine pollution is consistent with the definition codified by the United Nations Convention on the Law of the Sea (1982).

2.2 International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78)

The main objective of the MARPOL Convention is to force its Parties to prevent and minimize the marine pollution through ship discharge of harmful substances or effluents, including both accidental pollution and that from routine operations of ships. The Convention considers a substance to be harmful:

> […] if introduced into the sea, is liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea, and includes any substance subject to control by the present Convention.[73]

According just to this definition, if ballast water contains potential invasive species and/or pathogenic agents, it should also be considered as a harmful substance and the MARPOL Convention would thus apply to ballast water control. Indeed, initially it was understood that international rules governing ballast water and sediments would be annexed to this Convention.[74] However, as shown in the following pages, the subject of ballast water as a role was treated separately by IMO through an international convention that addressed ballast water specifically. Currently, the MARPOL Convention already contains international standards, described in its technical annexes, specifically for other six forms of ship source pollution:[75]

- Regulations for the Prevention of Pollution by Oil (Annex I), entry into force on 2 October 1983 and currently ratified by 146 States (98.73% of world tonnage);

[73] Article 2 (2) of the MARPOL Convention.
[74] Moira L. McConnell. GloBallast Monograph Series n°.1: Legislative Review. Final Report, Global Ballast Water Management Programme, 2002; Paragraph 3 of the Resolution MEPC 50(31) "International Guidelines for Preventing the Introduction of Unwanted Aquatic Organisms and Pathogens from Ships' Ballast Water and Sediment Discharges" p. 2, adopted on 4 July 1991.
[75] The information on the current status of ratification of each annex of MARPOL Convention is based on the IMO webpage "Summary of Conventions" as at 31 December 2007, available on http://www.imo.org/Conventions/mainframe.asp?topic_id=247/; accessed 09 January 2008.

- Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk (Annex II), entry into force on 2 October 1983 and currently ratified by 146 States (98.73% of world tonnage);
- Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form (Annex III), entry into force on 1 July 1992 and currently ratified by 128 States (94.50% of world tonnage);
- Prevention of Pollution by Sewage from Ships (Annex IV), entry into force on 27 September 2003 and currently ratified by 118 States (75.70% of world tonnage);
- Prevention of Pollution by Garbage from Ships (Annex V), entry into force on 31 December 1988 and currently ratified by 134 States (96.52% of world tonnage); and
- Prevention of Air Pollution from Ships (Annex VI), entry into force on 19 May 2005 and currently ratified by 47 States (74.73% of world tonnage).

Only Annexes I and II are compulsory to its State Parties, whereas the other four Annexes are voluntary unless the party has specifically accepted them.[76] In any case, some situations involving ballast water were considered by the MARPOL Convention, despite the provisions relevant to this seem to be only associated with the risks of the discharge of ballast water contaminated by oil and other harmful substances in marine environments. This was implicit through the definitions adopted in the Annexes I and II of the Convention that clearly do not consider any other contaminants than oil and noxious liquid substances for the concept of "clean" ballast water:

> *Clean ballast* means the ballast in a tank which since oil was last carried therein, has been so cleaned that effluent therefrom if it were discharged from a ship which is stationary into clean calm water on a clear day would not produce visible traces of oil on the surface of the water or on adjoining shorelines or cause a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines. If the ballast is discharged through an oil discharge monitoring and control system approved by the Administration, evidence based on such a system to the effect that the oil content of the effluent did not exceed 15 parts per million shall be determinative that the ballast was clean, notwithstanding the presence of visible traces;[77] or

[76] Article 14 (Optional Annexes) of MARPOL Convention.
[77] Regulation 1 (17) of the Revised Annex I of the MARPOL Convention, Adopted by Resolution MEPC.117(52) on 15 October 2004.

> *Clean ballast* means ballast water carried in a tank which, since it was last used to carry a cargo containing a substance in Category X, Y or Z,[78] has been thoroughly cleaned and the residues resulting there from have been discharged and the tank emptied in accordance with the appropriate requirements of this Annex;[79] and
>
> *Segregated ballast* means the ballast water introduced into a tank which is completely separated from the cargo oil and oil fuel system and which is permanently allocated to the carriage of ballast or to the carriage of ballast or cargoes other than oil or noxious liquid substances as variously defined in the Annexes of the present Convention;[80] or
>
> *Segregated ballast* means ballast water introduced into a tank permanently allocated to the carriage of ballast or cargoes other than oil or Noxious Liquid Substances as variously defined in the Annexes of the present Convention, and which is completely separated from the cargo and oil fuel system.[81]

Therefore, the MARPOL Convention, through Annexes I and II, established some requirements for the management of ballast water by ships that carry oil and noxious liquid substances.[82] These requirements address the main concerns regarding ballast water control. As far as ships are concerned, specific procedures were created for existing ships as well as specifications for projects and designs of new ships.[83] Regarding the use of ballast water in oil tanks, MARPOL implemented limitations for reducing the discharge of highly contaminated ballast water onto ports, minimizing the risks to marine resources and human health.[84] Requirements were also created to make possible the management and treatment of the

[78] According the definition in Appendix 1 (Guidelines for the Categorization of Noxious Liquid Substances) of the Revised Annex I of the MARPOL Convention, Adopted by Resolution MEPC.117(52) on 15 October 2004.
[79] Regulation 1 (3 Ballast water) of the Revised Annex II of the MARPOL Convention, Adopted by Resolution MEPC.118(52) on 15 October 2004.
[80] Regulation 1 (18) of the Revised Annex I of the MARPOL Convention, Adopted by Resolution MEPC.117(52) on 15 October 2004.
[81] Regulation 1 (3 Ballast water) of the Revised Annex II of the MARPOL Convention, Adopted by Resolution MEPC.118(52) on 15 October 2004.
[82] Regulation 16 (Segregation of oil and water ballast and carriage of oil in forepeak tanks) of the Annex I of the MARPOL Convention; and Regulation 5 (Discharge of Noxious Liquid Substances) of the Annex II of the MARPOL Convention.
[83] Regulation 18 (Segregated Ballast Tanks), Chapter 4 - Requirements for the Cargo Area of Oil Tankers, Part A (Construction) of the Revised Annex I of the MARPOL Convention, Adopted by Resolution MEPC.117(52) on 15 October 2004.
[84] Regulation 16 (paragraphs 1 and 2); Regulation 14 (paragraph 1) of the Revised Annex I of the MARPOL Convention, Adopted by Resolution MEPC.117(52) on 15 October 2004.

discharge of contaminated ballast water onto facilities that would be prepared to handle oily water and residues.[85]

Later, already in the scope of the specific convention addressing BWM, the use of onshore facilities were also proposed as an option for treating ballast water and eliminating alien species and pathogenic agents.[86] Thus, initiatives have been adopted to examine the feasibility of adapting the existing oily ballast water treatment facilities to also treat ballast water to reduce the chances of biological invasions and diseases occurrences.

2.3 The United Nations Convention on the Law of the Sea (UNCLOS, 1982)

Since 1982, the United Nations Convention on the Law of the Sea had already established that the States have the responsibility to protect and preserve the marine environment.[87] Moreover, the UNCLOS also addressed the issue since had stated that the Parties would have to take actions in avoiding marine pollution[88] and the introduction of exotic species[89] that could cause damage to the marine environment.

The UNCLOS defined "pollution of the marine environment" as:

> the introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities.[90]

Therefore, the UNCLOS demanded from States, individually or jointly as appropriate, the adoption of measures to prevent, reduce and control pollution of the marine environment from

[85] Regulations 2 (paragraphs 4 and 6), 3 (paragraphs 4 and 5.2.2), 12 (paragraph 3), 13, 14 (paragraphs 3 and 5.3.2), 15 C (paragraph 6) and D (paragraph 9), 16 (paragraph 2), 30 (paragraph 1), 34 C (paragraph 6) and D (paragraph 9), and on Regulation 38 (Chapter 6 - Reception facilities) of the Revised Annex I of the MARPOL Convention, Adopted by Resolution MEPC.117(52) on 15 October 2004; and Regulation 4 (paragraph 3.3), and on Regulation 18 (Chapter 8 - Reception Facilities) of the Revised Annex II of the MARPOL Convention, Adopted by Resolution MEPC.118(52) on 15 October 2004.

[86] Guidelines for Ballast Water Reception Facilities (G5), Annex 5 of the Ballast Water Convention, adopted by Resolution MEPC.153(55) on 13 October 2006.

[87] Article 192 (General obligation) of the United Nations Convention on the Law of the Sea, 1982.

[88] Article 194 (Measures to prevent, reduce and control pollution of the marine environment) of the United Nations Convention on the Law of the Sea, 1982.

[89] Article 196 (Use of technologies or introduction of alien or new species) of the United Nations Convention on the Law of the Sea, 1982.

[90] Article 1 (4) (Use of terms and scope) of the United Nations Convention on the Law of the Sea, 1982.

all type of sources. More specifically concerning ships, the Convention stated that these measures include those designed to minimize:

> pollution from vessels, in particular measures for preventing accidents and dealing with emergencies, ensuring the safety of operations at sea, preventing intentional and unintentional discharges, and regulating the design, construction, equipment, operation and manning of vessels.[91]

Furthermore, with regard to the introduction of alien species, UNCLOS established that:

> States shall take all measures necessary to prevent, reduce and control pollution of the marine environment resulting from [...] the intentional or accidental introduction of species, alien or new, to a particular part of the marine environment, which may cause significant and harmful changes thereto.[92]

Considering the UNCLOS definition of marine pollution and what was established more specifically in its Articles 194 and 196, in addition to the MARPOL definition for harmful substances, it seems clear that ballast water discharges must be considered by States under the same attention of any other compound or substance that possesses great potential to cause marine pollution. Both Conventions have set a structure of rules that generally called the States to promote the control of all types of marine pollution possibly caused by ballast water, but did not detail how to exactly achieve this goal when the main issues involved with the transferences of alien species and pathogenic agents are considered.

As a framework convention, many of UNCLOS' provisions only set out general principles that can only be effectively implemented through the definition of extremely precise and operative technical rules and standards in other international treaties,[93] or implementation agreements. This is especially the case with regard to the UNCLOS provisions related to the protection and preservation of the marine environment.[94] The adoption of international treaties

[91] Art. 194 - 3 (b) (*op cit.*) of the United Nations Convention on the Law of the Sea, 1982.
[92] Art. 196 (*op cit.*) of the United Nations Convention on the Law of the Sea, 1982.
[93] Agustín Blanco-Bazán, IMO interface with the Law of the Sea Convention. Paper presented at the Seminar on current maritime issues and the work of the International Maritime Organization. Twenty-Third Annual Seminar of the Center for Ocean Law and Policy, University of Virginia School of Law, IMO, 2000. Available on http://www.imo.org/INFOrESOURCE/mainframe.asp?topic_id=406&doc_id=1077/; assessed 6 December 2007.
[94] Gabriele Goettsche-Wanli, Legal instruments that support the implementation of the United Nations Convention on the Law of the Sea (part II). Presentation in New York Marine environment from the conclusion of the United Nations Convention on the Law of the Sea to the World Summit on Sustainable Development. DOALOS/UNITAR Briefing on Developments in Ocean Affairs and the Law of the Sea 20 Years After the Conclusion of the United Nations Convention on The Law of the Sea. United Nations Headquarters, 26 September 2002.

addressing environmental aspects of international shipping is one of IMO's incumbencies and, as outlined below, due to the significance of the issue and the lack of specific rules, IMO was called upon to develop a BWMC. However, provisions established by the IMO conventions are not binding for UNCLOS States unless they also became parties to the same treaties. The criteria of the number of State parties is one big obstacle for the BWMC coming into force.[95]

2.4 The United Nations Conference on Environment and Development (UNCED, 1992)

The United Nations Conference on Environment and Development, also known as the "Earth Summit", through one of its non-binding instruments called the Rio Declaration on Environment and Development, reaffirmed and reinforced the Declaration of the UNCHE (1972). Although the Rio Declaration covers a wide range of issues including the role of women, indigenous people, and armed conflict; its general principles are also directly relevant to the issue of marine environmental protection.[96]

Another non-binding instrument of UNCED is Agenda 21, a "comprehensive plan of action to be taken globally, nationally and locally by organizations of the United Nations System, Governments, and Major Groups in every area in which human impacts on the environment."[97] It corresponds to a type of "implementation guide" for a new model of development, which must be: sustainable in the use of natural resources and promotes the conservation of the environment, fair in economic relations between States and nationally through the reduction of national social inequality, economic inefficiencies, and politically participatory and democratic.

Agenda 21 calls on all spheres of Government and civil organizations to establish plans for concrete action to be taken by diverse stakeholders and groups of society in the short, medium

[95] The updated status of UNCLOS, of the Agreement relating to the implementation of its Part XI and of the Agreement for the implementation of its provisions relating to the conservation and management of straddling fish stocks and highly migratory fish stocks is available on: http://www.un.org/Depts/los/convention_agreements/convention_agreements.htm/.

[96] Julian Roberts, Marine Environment Protection and Biodiversity Conservation. The Application and Future Development of the IMO's Particularly Sensitive Sea Area Concept. Chapter 2 - International Legal Framework for the Protection of the Marine Environment. Springer Berlin Heidelberg, 2007.

[97] Quoted from the United Nations webpage: Economic and Social Development / Division for Sustainable Development, available on http://www.un.org/esa/sustdev/documents/agenda21/index.htm/; accessed 12 May 2007.

and long term. These actions should consider feasible goals, available resources and responsibilities previously defined. Although wide in scope, provisions of the Agenda 21 also address issues related to ballast water as a threat to marine environments; these are outlined below.

2.4.1 Agenda 21

Chapter 17 of Agenda 21 is dedicated to the "protection of the oceans, all kinds of seas, including enclosed and semi-enclosed seas, and coastal areas and the protection, rational use and development of their living resources". In this chapter, the UNCED recognized that marine pollution is also caused by shipping and sea-based activities,[98] as well as the necessity for a precautionary and anticipatory rather than reactive approach to prevent the degradation of the marine environment.[99] Therefore, considering the role of shipping activities in the devastation of the marine environment and ballast water as one of the main causes for this, the IMO and other international bodies were requested to take action to address the transfer of alien species by ships:

> States, acting individually, bilaterally, regionally or multilaterally and within the framework of IMO and other relevant international organizations, whether subregional, regional or global, as appropriate, should assess the need for additional measures to address degradation of the marine environment: (a) From shipping by: (vi) Considering the adoption of appropriate rules on ballast water discharge to prevent the spread of non-indigenous organisms.[100]

2.4.2 Convention on Biological Diversity (CBD)

The Convention on Biological Diversity was one of the two binding instruments included in the agreements adopted by UNCED, the other was the United Nations Framework Convention on Climate Change (UNFCCC). According to Article 1, the main objectives of the CBD are the "conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources". Although the CBD was opened for signature at UNCED (5 June 1992), it only entered into

[98] Chapter 17.20 (Section II Conservation and Management of Resources for Development) of the Agenda 21: Earth Summit – The United Nations Programme of Action from Rio, 294 p. April 1993.
[99] *Ibid.*, Chapter 17.21.
[100] *Ibid.*, Chapter 17.30.

force on 29 December 2003 and currently 190 States (168 signatures) are Parties of the Convention[101] and are committed to acting appropriately to conserve biological diversity.

The CDB contains several provisions related to ballast water, the main elements of which are stipulated in Article 8 where each contracting Party is called to take actions to promote on-site conservation:

> Rehabilitate and restore degraded ecosystems and promote the recovery of threatened species, inter alia, through the development and implementation of plans or other management strategies;[102] [and]
>
> Prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species.[103]

In order to implement the above provisions, the CBD further stipulates in its Article 7 the necessity for States to identify processes and categories of activities which have or are likely to have significant adverse impacts on the conservation and sustainable use of biological diversity; and monitor, through sampling and other techniques, the effects of these activities and the components of biological diversity. The implementation of specific programs or plans for environment monitoring in port areas would thus seem essential for the effective management of ballast water.

More recently, at its eighth meeting (Curitiba, 20-31 March 2006), the Conference of the Parties to the Convention on Biological Diversity (COP) adopted Decision VIII/27[104] regarding the "Alien species that threaten ecosystems, habitats or species (Article 8 (h)): further consideration of gaps and inconsistencies in the international regulatory framework." The COP is the governing body of the CBD and advances the implementation of its provision through the decisions it takes during periodic meetings. It is important to note that, through the Decision VIII/27, COP encourages Parties to:

> Build capacity for action at the national level for addressing the various pathways for introduction and spread of invasive alien species[105] [...]; [and]

[101] List of States Party to the CBD, CBD Secretariat, available on: http://www.cbd.int/convention/parties/list.shtml/; accessed 9 January 2008.
[102] Article 8 (In-situ Conservation) (f) of CBD.
[103] Article 8 (*op cit.*) (h) of CBD.
[104] UNEP/CBD/COP/8/31, p. 240, Curitiba, 2006.
[105] Decision VIII/27 (Paragraph 4) of the UNEP/CBD/COP/8/31, p. 240, Curitiba, 2006.

> Note that actions to address invasive alien species need to be taken at the international, regional, national and/or subnational levels and emphasizes the need to promote consistency among actions and efforts at the various levels [...].[106]

Moreover, having already considered ballast water as an important vector for the introduction of alien species in coastal areas, COP:

> Urges Parties and other Governments to ratify and implement the International Convention on the Control and Management of Ships' Ballast Water and Sediments as soon as possible;[107]
>
> Urges Parties and other Governments to address, in their national legislation, the issue of domestic translocation of ballast water, by vessels requiring equivalent compliance with but not covered by the International Convention on the Control and Management of Ships' Ballast Water and Sediments, as stipulated in the guideline for equivalent compliance for small craft which is under consideration by the Marine Environmental Protection Committee of the International Maritime Organization;[108]
>
> Urges Parties and other Governments to increase the degree of communication and coordination between national agencies responsible for inputs to and implementation of the Convention on Biological Diversity and International Maritime Organization;[109]
>
> Invites the regional seas conventions and action plans to support implementation of the International Convention on the Control and Management of Ships' Ballast Water and Sediments, and to encourage regional harmonization in implementation.[110]

Considering the COP provisions outlined above, in addition to international conventions and treaties, the decrease and control of the risks of new introductions and the dispersal of alien species also depends on the adoption of national and/or subnational measures. Of course, these measures must not affront the international agreements on the same issue, which is very important in the case of ballast water management since shipping is a worldwide activity. Because ships are constantly traveling between ports of different parts of the world, visiting practically all coastal States and, once inside their territorial seas, being subjected to their own environmental rules and requirements, it is much simpler for the shipping industry to have one

[106] *Ibid.*, Paragraph 9, p. 241.
[107] *Ibid.*, paragraph 25, p. 242.
[108] *Ibid.*, paragraph 26, p. 243.
[109] *Ibid.*, paragraph 27, p. 243.
[110] *Ibid.*, paragraph 28, p. 243.

set of rules to comply with. However, this does not imply that the rules have to be permissive or favorable to the shipping industry to the detriment of the environment, coastal populations and other industries that use marine and/or hydrological resources.

The fact that the States Party and other Governments have been asked to consider in their national legislation the issue of domestic translocation of ballast water shows how national initiatives can be important and that they must be part of the solution to the problem. It should be noted that two years after the adoption of the BWMC (February 2004) the COP in Curitiba still had to incite States to ratify and that currently, at the beginning of 2008, the situation has not significantly change nor is there indication that it will change in the near future.

Thus, despite the recognition of IMO's functions and the need for global rules that determine how the world's shipping should behave to protect the environment, States should not wait indefinitely for an international consensus for adopting stricter requirements that allow them to ensure the preservation of their coastal environments and the reduction of economic and social impacts involved. Futhermore, the process of developing national measures should be conducted in a manner that enables the institutional integration of all agencies and other official institution responsible for regulating shipping and port activities in every aspect concerned.

2.5 International Convention for the Control and Management of Ships' Ballast Water and Sediments (2004).

This section presents the IMO and outlines how the issue of ballast water management has been developed under its guidance, since the elaboration of the first international voluntary guidelines (4 July 1991) up to the adoption of the BWMC (16 February 2004).

2.5.1 The International Maritime Organization

The IMO is the United Nations technical and specialized agency responsible for improving maritime safety, preventing pollution from ships, and promoting technical co-operation amongst its member States. The Agency was established by the Convention on the

International Maritime Organization[111] (IMO Convention) adopted in Geneva in 1948. Today, IMO has 167 Member States and three Associate Members.[112] Moreover, there are also 65 Non-Governmental Organizations (NGOs) and 42 Inter-governmental Organizations (IGOs) with consultative status or agreements of co-operation with IMO. To fulfill its purpose and the demand given by UNCED concerning the ballast water issue, IMO undertook the following actions:[113]

- (1990) The creation of a working group on ballast water within its Marine Environment Protection Committee (MEPC);[114]

[111] IMO Convention established the "Inter-Governmental Maritime Consultative Organization" (IMCO), which in 1982 was renamed the International Maritime Organization (IMO). The IMO Convention entered into force in 1958 and the first meeting of IMO took place in the following year. As corrected by resolution A.371 (X) of 9 November 1977, one of the purposes of the IMO described in Article 1 (a) of the IMO Convention is:

> To provide machinery for co-operation among Governments in the field of governmental regulation and practices relating to technical matters of all kinds affecting shipping engaged in international trade, and to encourage the general adoption of the highest practicable standards in matters concerning maritime safety, efficiency of navigation and prevention and control of marine pollution from ships; and to deal with administrative and legal matters related to the purposes set out in this Article;

[112] Hong Kong (China), Macao (China) and The Faroe Islands (Denmark) became associated members of IMO according Article 72 of IMO Convention, which provides:

> (a) Members may make a declaration at any time that their participation in the Convention includes all or a group or a single one of the Territories for whose international relations they are responsible; [and] (b) The Convention does not apply to Territories for whose international relations Members are responsible unless a declaration to that effect has been made on their behalf under the provisions of paragraph (a) of this Article.

Also, Article 8 of the IMO convention provides that:

> Any Territory or group of Territories to which the Convention has been made applicable under Article 72, by the Member having responsibility for its international relations or by the United Nations, may become an Associate Member of the Organization by notification in writing given by any such Member or by the United Nations as the case may be, with the Secretary-General of the United Nations.

[113] Steve Raaymakers, IMO Ballast Water Update – 2002. (Technical Adviser) Global Ballast Water Management Programme, International Maritime Organization, p. 2, 2002.

[114] The Marine Environment Protection Committee (MEPC) is the senior technical body of IMO and represents all Member States in the consideration of matters addressing the prevention and control of pollution from ships. In particular, the MEPC is concerned with the adoption and amendment of conventions and other regulations and measures to ensure their enforcement. To accomplish its work, the MEPC and IMO's Maritime Safety Committee (MSC) are assisted by nine sub-committees that deal with the following subjects: Bulk Liquids and Gases (BLG); Carriage of Dangerous Goods, Solid Cargoes and Containers (DSC); Fire Protection (FP); Radio-communications and Search and Rescue (COMSAR); Safety of Navigation (NAV); Ship Design and Equipment (DE); Stability and Load Lines and Fishing Vessels Safety (SLF); Standards of Training and Watchkeeping (STW); and Flag State Implementation (FSI).

- (1991/1993/1997) The adoption of guidelines for control and management of ballast water to minimize the transfer of harmful and pathogenic aquatic organisms;
- (2000) The definition of a joint initiative with the Global Environment Facility (GEF) and the United Nations Development Programme (UNDP) to identify and evaluate barriers related to ballast water in some of the developing regions of the world so that those barriers can be effectively overcome; and
- (2004) The development of a new international legal instrument on BWM to be considered for adoption through an IMO Diplomatic Conference.

2.5.2 The First IMO Guidelines for Ballast Water

Canada and Australia, after experiencing particular problems with unwanted species (zebra mussels and Japanese dinoflagellates respectively) brought their concerns to the attention of MEPC in the late 1980s.[115] In 1990, as a response to problems encountered concerning ballast water and associated sediments as a source of biological introductions into marine waters, the MEPC at its 31 session created a working group on ballast water to develop guidelines addressing the problem of alien species.[116] Thus, in 1991, IMO adopted MEPC resolution 50(31), the first international voluntary "Guidelines for Preventing the Introduction of Unwanted Organisms and Pathogens from Ships' Ballast Water and Sediment Discharges." [117]

As previously outlined in section 2.4.1 above, during the subsequent year UNCED recognized ballast water as a major international concern through its Agenda 21 and, in November 1993, the IMO Assembly responded to the explicit request by adopting guidelines in Assembly Resolution A.774(18). These second guidelines were similarly named and based on MEPC resolution 50(31) and MEPC and MSC were requested to keep them under regular review with a view to developing internationally applicable and legally-binding provisions.[118]

[115] The United Nations Atlas of the Oceans website, *op cit*.
[116] IMO, Focus on IMO: MARPOL - 25 years. International Maritime Organization, London, 33 pp., 1998. Available on http://www.imo.org/includes/blastDataOnly.asp/data_id%3D7993/MARPOL25years1998.pdf/; accessed 17 August 2007.
[117] Annex 16, Resolution MEPC. 50 (31), Guidelines for Preventing the Introduction of Unwanted Organisms and Pathogens from Ships' Ballast Water and Sediment Discharges, adopted on 4 July 1991.
[118] IMO, available on: http://www.imo.org/Environment/mainframe.asp?topic_id=548/; accessed 17 August 2007.

Subsequently, in 1997, more complete measures were adopted through Resolution A.868 (20): "Guidelines for the control and management of ships' ballast water, to minimize the transfer of harmful aquatic organisms and pathogens."[119] Resolution A.868 (20) further requests Governments to "take urgent action in applying these Guidelines, including the dissemination thereof to the shipping industry, to use them as a basis for any measures they adopt with a view to minimizing the risks of introducing harmful aquatic organisms and pathogens". And also requests MEPC to "work towards completion of legally binding provisions on BWM in the form of a new Annex to MARPOL 73/78, together with guidelines for their uniform and effective implementation with a view to their consideration and adoption in the year 2000". Ballast water management and control measures recommended by Resolution A.868(20) Guidelines include:

- Minimizing the uptake of harmful aquatic organisms, pathogens and sediments when loading ballast by avoiding areas in ports with: outbreaks, infestations or known populations of harmful organisms and pathogens; areas with current phytoplankton blooms (algal blooms, such as red tides); nearby sewage outfalls; nearby dredging operations; when a tidal stream is known to be the more turbid; areas where tidal flushing is known to be poor; in darkness when bottom-dwelling organisms may rise up in the water column; in very shallow water; or where propellers may stir up sediment;[120]
- Cleaning ballast tanks and removing mud and sediments those accumulate in these tanks on a regular basis, which may harbor harmful organisms;[121]
- Avoiding unnecessary discharge of ballast;[122]
- Exchanging ballast water at sea, 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;[123]

[119] GloBallast Programme website, available on: http://globallast.imo.org/index.asp?page=resolution.htm/; accessed 20 August 2007.
[120] Section 8.2.2 and 9.1.1 of IMO Resolution A.868(20): Guidelines for the Control and Management of Ships' Ballast Water to Minimize the Transfer of Harmful Aquatic Organisms and Pathogens. Assembly 20th Session, Agenda item 11, adopted on 27 November 1997.
[121] *Ibid*., Section 9.1.2.
[122] *Ibid*., Section 9.1.3.

- Every ship with ballast water should be provided with a “ballast water management plan” (BWMP) elaborated specifically to each ship to provide safe and effective procedures for BWM. The BWMP should be included in the ship's operational documentation;[124]
- Ballast water reporting form (BWRF) to be provided to Port State Authority upon request (Annex 02);[125]
- Non-release or minimal release of ballast water;[126]
- Discharge to onshore reception and treatment facilities;[127] and
- The use, in substitution of or in conjunction with the previous options, of viable new technologies and treatments.[128]

With the same importance given to measures to be undertaken by ships, Resolution A.868(20) Guidelines also requires port States to carry out monitoring or enforcement activities in a fair, uniform and nationally consistent manner at all their ports.[129] One strategy to monitor ships’ compliance with the guidelines would be for port States authorities to perform analysis of ballast water and sediment samples to test for the continued survival of harmful aquatic organisms and pathogens.[130] Sampling activities could be undertaken for monitoring, research or enforcement purposes.[131] Considering the costs of such measures to the shipping industry, the guidelines also required that the process for taking and analyzing samples should not cause significant delays to ships.[132] However, the guidelines also allow the possibility for port State authorities to take samples before permitting a ship to discharge its ballast water in environmentally sensitive locations and further stipulate that port State's

[123] *Ibid*., Section 9.2.1.
[124] *Ibid*., Section 7.1.1.
[125] *Ibid*. Appendix 1.
[126] *Ibid*. Section 9.2.2.
[127] *Ibid*. Section 9.2.3.
[128] *Ibid*. Section 9.2.4.
[129] *Ibid*. Section 11.7.
[130] *Ibid*. Section 11.8.
[131] *Ibid*. Section 11.13.
[132] *Ibid*. Section 11.9.

contingency strategy be applied when harmful aquatic organisms or pathogens are found to be present in the analyzed samples.[133]

Therefore, as will be show in the following subsections, it is possible to observe that the roots of the current measures for BWM adopted through the BWMC are the same as those prescribed 10 years ago. However, despite the already recognized importance of the issue at that time, according to a review conducted by Australia in 1993[134] very few States have implemented the guidelines and the sections on dissemination of information, training and education, and enforcement and monitoring by port States have not been given adequate attention.[135] Thus, it is possible to consider that the shipping industry probably and conveniently has not felt compelled enough to promote changes in the ships' ballast and unballast procedures and that, consequently, most of the marine environments worldwide have continued to exist under the same risks and threats of biological invasions.

2.5.3 Global Ballast Water Management Programme (GloBallast)

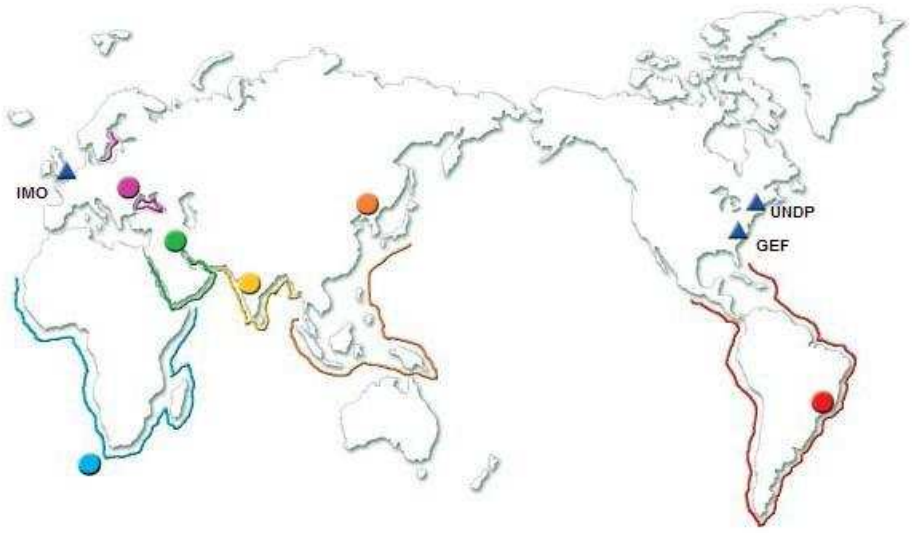
As was previously noted, the GloBallast Programme represents one of the actions carried out by IMO in response to UNCED with respect to the ballast water problem. The full title of this project is "Removal of Barriers to the Effective Implementation of Ballast Water Control and Management Measures in Developing Countries."[136] The implementation of the project was made possible through the joint actions of IMO, GEF, UNDP, member States and the shipping industry.[137]

The purpose of GloBallast's first phase was to provide technical assistance to developing States in order to reduce the transfer of harmful organisms from ballast water. One of the advances expected through the execution of this program was the implementation of voluntary

[133] *Ibid*. Section 11.14.
[134] Victoria Cullins, Prevention of Introduction of the European Green Crab *Carcinus maenas* to the Marine Environments of Hawaii: Methods to Avoid Marine Invasions, Online report available on: http://www.botany.hawaii.edu/bot350/1997/cullins/gcrab~1.htm/; accessed 9 December 2007; and Eugene H. Buck, CRS Report for Congress Ballast Water Management to Combat Invasive Species. Order Code RL32344, Specialist in Natural Resources Policy Resources, Science, and Industry Division, Congressional Research Service, The Library of Congress, p. 8, 2005.
[135] Steve Raaymakers, IMO Ballast Water Update, *op cit*. p. 2.
[136] GloBallast Programme, available on: http://globallast.imo.org/; accessed 14 May 2007.
[137] The initial funding was US$ 7.392 million from GEF plus US$ 5.937 million (actual at end of project) in co-financing from the six Pilot Countries. UNDP, GloBallast Programme, available on: http://www.undp.org/gef/05/portfolio/writeups/iw/goballast.html/; accessed 18 December 2007.

measures outlined in IMO's Resolution A.868 (20). Taking into consideration that, at that time, the idea of adopting a new and specific convention addressing BWM was already established, the GloBallast Programme could assist developing States to be better prepared for its subsequent implementation.

Six ports in six States were chosen to represent the main developing regions of the world (Figure 6). Thus, in order to achieve the goals of the program, these selected States were provided with training, technical assistance, and institutional reinforcement. The map below shows the location of the selected States:



Demonstration Site	Pilot Country	Region
Dalian	China	Asia/Pacific
Khark Is	I.R. Iran	ROPME Sea Area & Red Sea
Mumbai	India	South Asia
Odessa	Ukraine	Eastern Europe
Saldanha	South Africa	Africa
Sepetiba	Brazil	South America

Figure 6. GloBallast Demonstration Sites[138]

The GloBallast's first phase started in March 2000 and ended in December 2004. The original project cycle was three years, since at that time the international community was

[138] Source: GloBallast Programme, available on http://globallast.imo.org/.

planning to adopt new regulations for ballast water transfer in 2002.[139] Nevertheless, due to the complexity of the matter, the negotiations between the member States were prolonged more than expected and the diplomatic conference to adopt a new International Ballast Water Convention was postponed to 2004. Therefore, to not cause an interval of inactivity and a consequent loss of momentum already acquired by the GloBallast Programme, it was decided to also extend its first phase until the end of the same year.[140]

The activities carried out at these sites focused on institutional strengthening and capacity building, and included:[141]

- Establishment of National Lead Agencies and Focal Points for ballast water issues;
- Formation of cross-sectorial/inter-ministerial Country Task Forces;
- Communication and awareness raising activities;
- Ballast water risk assessments;
- Port biota baseline surveys;
- Ballast water sampling;
- Training in implementation of the IMO Ballast Water Guidelines;
- Assistance in national ballast water legislation and regulations;
- Training and technical assistance in compliance monitoring and enforcement;
- Assistance in developing national BWM strategies and action plans;
- Assistance in developing self-financing and resourcing mechanisms; and
- Initiation of co-operative regional arrangements between neighboring countries for BWM.

At the end of the first phase, GloBallast Programme was considered a successful project as, amongst other things, it "[had] achieved an exemplary and outstanding level of awareness

[139] Alexandre de Carvalho Leal Neto and Silvio Jablonski, O Programa GloBallast no Brasil. In: Julieta Salles Vianna da Silva and Rosa Cristina Corrêa Luz de Sousa, Água de Lastro e Bioinvasão. Rio de Janeiro: Ed. Interciência, p. 12, 2004.
[140] *Ibid*. p. 13.
[141] Steve Raaymakers, IMO Ballast Water Update, *op cit*. p. 4.

raising at the national, regional and global level."[142] According to its official Independent Mid Term Evaluation, some delays in certain components and outputs had occurred, mainly related to legislation, compliance, monitoring and enforcement, but were due to external circumstances and not the fault of the project.[143] The root causes associated with these issues in the initial six pilot States were grouped in the following categories:[144]

- International and cross boundary character of the shipping industry;
- Institutional and legal arrangements are insufficient or inadequate to address the ballast water problem;
- Lack of readily available, cost effective and viable treatment technologies to prevent the introduction of unwanted organisms in ships' ballast water;
- Broad lack of awareness regarding aquatic invasive species;
- Limited financial resources allocated to address ballast water issues; and
- Poor and inconsistent regional cooperation.

Building on the outcomes of the First Phase, a project for a second phase of GloBallast called "Building Partnerships to Assist Developing Countries to Reduce the Transfer of Harmful Aquatic Organisms in Ships' Ballast Water" (GloBallast Partnerships),[145] was elaborated during 2005 and 2006. During the design and development process for the GloBallast Partnership project, IMO, UNDP and the GEF Secretariat once again identified and emphasized the need for national level legal, policy and institutional reforms as the major focus of the coordinated effort with partnering States.[146] Other identified potential approaches to be considered included:[147]

- Importance to develop financially and institutionally sustainable BWM strategies at the national level;

[142] Vousden, D. and Okamura, B., GloBallast Project Independent Mid Term Evaluation (MTE): Final Report, IMO London, p. 2, 2003.
[143] *Ibid*.
[144] UNDP, Building Partnerships, *op cit*. p. 5.
[145] The preparatory phase of the GloBallast Partnerships was called "PDF-B project" and initiated on 1 April 2005 with funding of around US$700,000 from the GEF. Marine Environment Protection Committee (MEPC), 53rd session: 18-22 July 2005.
[146] UNDP, Building Partnerships, *op cit*. p. 3-4.
[147] *Ibid*.

- Incremental and strategic focus of GEF intervention in particularly vulnerable countries;
- Objective of spurring North-South collaboration;
- Opportunities for the project to instigate action on marine electronic information system development, and linkages with the Marine Electronic Highway development efforts; and
- Desire to have the project foster a close partnership with industry.

Therefore, the pre-eminent focus of GloBallast Partnerships is at the national level where, together with the "industry" level, it is expected that the real actions can be taken to reduce the risks from ship-borne invasive species.[148] In April 2007, the funding for the GloBallast Partnerships project was approved by the GEF.[149] Generally, the objective of the GloBallast Partnerships is to assist particularly vulnerable States and/or regions such as the Caribbean and Pacific islands (Figure 7) to enact institutional, legal, and policy reforms to meet the objectives of the BWMC. For this purpose, it will cover 14 developing sub-regions and include 13 Lead Partnering Countries (LPC) and more than 40 participating States that have shown keen interest in participating in the project.[150] The four key results expected from the project are as follows:[151]

- Learning, evaluation and adaptive management increased;
- BWM Strategies in place, with legal, policy and institutional reforms developed, implemented and sustained at national level;
- Knowledge management tools and marine monitoring systems are effectively utilized to expand global public awareness and stakeholder support, improve understanding of ballast water impacts on marine ecology, and enhance maritime sector communications; and

[148] *Ibid.* p. 15.
[149] The expected starting date of GloBallast Partnerships is August 2007. It is intended to be a five-year project supported by a total financing plan of US$ 23,389,939 (GEF Total US$ 5,688,000; GEF IA/ExA US$ 4,318,800; Government US$ 9,849,799; Others US$ 3,533,340; and Co-financing Total US$ 17,701,939). GEFSEC Project ID: 2261; IA/ExA Project ID: PIMS N° 3050, 23 April 2007.
[150] Source of the information: Latest News of IMO, Briefing 16, 21 June 2007, available on IMO website: http://www.imo.org/; accessed 15 November 2007.
[151] UNDP, Building Partnerships [...] *op cit.* p. 19-20.

- Public-private partnerships developed to spur the development of cost-effective ballast water technology solutions.

As will be outlined in the following sections, the GloBallast Partnerships also play an important role as a catalyst for to the ratifying process of the BWMC. This because some of the States who endorsed and commited to participate in this project represent a significant percentage of the world merchant fleet (WMF), for instance Panama, Bahamas, India, and China. According to data from 2005, over 40 States that endorsed and supported the project represent approximately 37% of the WMF,[152] and it is expected that at least two thirds of the lead partner States will ratify the BWMC during the course of the GloBallast Partnerships.[153]

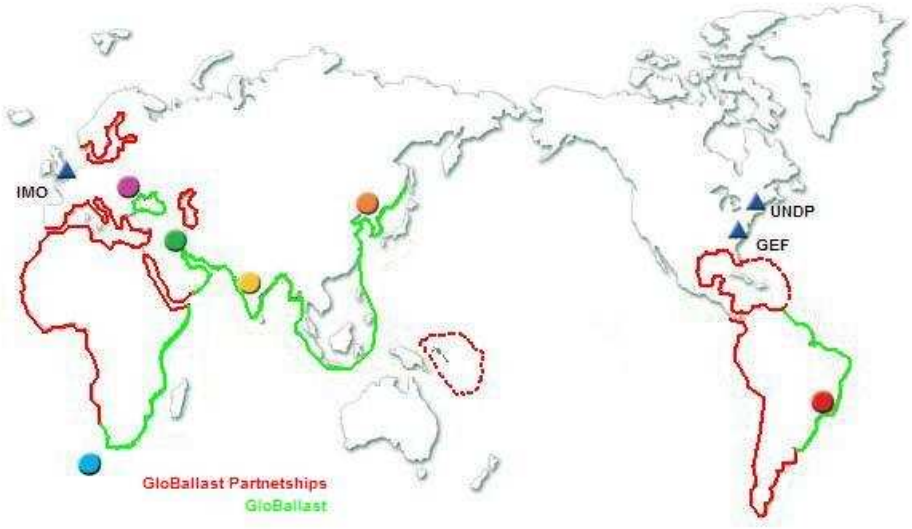


Figure 7. Regions covered by GloBallast (green) and GloBallast Partnerships (red) Programmes[154]

[152] *Ibid*. p. 49.
[153] *Ibid*. p. 46-47.
[154] The GloBallast Partnerships six priority regions are: the Wider Caribbean, Mediterranean Sea, Pacific Coast of South America, Red Sea and Gulf of Aden, West Coast of Africa, and South Pacific Islands. The regions of the GloBallast first phase are: Southwest Atlantic coast of South America, South East Asia, South Asia, Persian Gulf, West Indian Ocean (Southern and East Africa). Map adapted from GloBallast (http://globallast.imo.org) and UNDP, Building Partnerships, *op cit*. p. 15.

2.5.4 International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004

The BWMC[155] was adopted by consensus at a diplomatic conference held at IMO in London in February 2004. The BWMC falls within category of prevention of marine pollution, which is one of the three main groups of IMO conventions.[156] The BWMC was opened for signature from 1 June 2004 to 31 May 2005 and eight States (Argentina, Australia, Brazil, Finland, Maldives, Holland, Spain and Syrian) signed the instrument indicating their agreement with the proposal, which still needed to be ratified. Brazil signed the BWMC on 25 January 2005, but has not yet ratified.

2.5.4.1 Entry into force

Before a convention comes into force it has to be ratified by individual Governments. Generally, the more important and more complex the subject, and the more stringent are the conditions for the convention entry into force.[157] Since 05/31/2005, the BWMC has been opened to adhesion of any State and the Maldives became the first Contracting Party after depositing the instrument of pertinent ratification on 06/22/2005. According its Article 18:

> Convention shall enter into force twelve months after the date on which not less than thirty States, the combined merchant fleets of which constitute not less than thirty-five percent of the gross tonnage[158] of the worlds merchant shipping, have

[155] IMO, Adoption of the Final Act and any Instruments, Recommendations and Resolutions Resulting from the Work of the Conference: International Convention for the Control and Management of Ships' Ballast Water and Sediments. Text adopted by the International Conference on Ballast Water Management for Ships, Agenda item 8, 16 February 2004.

[156] IMO. The other two main categories are maritime safety and liability and compensation, especially in relation to damage caused by pollution. The other conventions not included in these major groups include facilitation, tonnage measurement, unlawful acts against shipping and savage, etc. Available on http://www.imo.org/; accessed 15 October 2007.

[157] For instance, the International Convention for the Safety of Life at Sea (SOLAS, 1974) provided that entry into force requires acceptance by 25 States whose merchant fleet comprise not less than 50% of the world's gross tonnage. SOLAS came into force on 25 May 1980. On the other hand, the International Convention for the Prevention of Pollution from Ships (1973) provided that entry into force requires acceptance by 15 States whose merchant fleet comprise not less than 50% of the world's gross tonnage. By 1976 this Convention had only received three ratifications (<1% of the WMF). In 1978, the MARPOL Protocol absorbed the parent Convention in a combined instrument: the International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 relating thereto (MARPOL 73/78) that finally entered into force on 2 October 1983 for its Annexes I and II.

[158] Gross Tonnage: A figure obtained by dividing the total volume of the ship, in cubic feet, by 100, after the omission of all spaces exempted from measurement by law. The entire internal cubic capacity of the ship expressed in tons of 100 cubic feet to the ton, except certain spaces that are exempted, such as: (1) peak and other tanks for ballast water, spaces above the uppermost continuous deck such as: open forecastle, bridge and poop,

> either signed it without reservation as to ratification, acceptance or approval, or have deposited the requisite instrument of ratification, acceptance, approval or accession.[159]

Currently, it is expected that the entry into force of the BWMC may be delayed due to lack of signatory States with sufficient WMF tonnage.[160] The necessary 35% of the gross tonnage of the WMF regards States represented by the ships flags, which means the States where ships are registered; which are not necessarily are the same States where the real ship-owners' companies are located.

A large number of ships are registered under "flags of convenience"[161] (FOC), in States such as Liberia, Panama,[162] Bahamas, Marshall Islands, Malta, Cyprus, Isle of Man and Bermuda, which the combined tonnage represents 52% of the WMF.[163] Due their condition as FOC States it is expected that the enforcement of legal environmental requirements may possibly be weak or even inexistent,[164] so they can continue to be attractive to the shipping industry for registering of ships.

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certain light and air spaces, domes of skylights, condenser, anchor gear, wheel house, gallery and cabins for passengers. In: Jeffrey W. Monroe and Robert J. Stewart, Dictionary, *op cit*. p. 201.

[159] The terms for signature, ratification, acceptance, approval and accession are mentioned in the Article 17 of the BWMC.

[160] ICES Advisory Committee on the Marine Environment. ICES WGBOSV Report 2006, *op cit*. p. 12.

[161] Flag of convenience: the registration of ships in a country whose tax on the profits of trading ships is low or whose requirements concerning manning or maintenance are nor stringent. Sometimes referred to as flags of necessity; denotes registration of vessels in foreign nations that offer favorable tax structures and regulations; also the flag representing the nation under whose jurisdiction a ship is registered. Ships are always registered under the laws of one nation but are not always required to establish their home location in that country. In: Jeffrey W. Monroe and Robert J. Stewart, Dictionary, *op cit*. p. 175.

[162] According the American Bureau of Shipping Ship Classification Society, discharges of ballast water is prohibited in the Panama Canal. Available on: http://www.eagle.org/regulatory/regupdate/mep41/Ballast_Water_Managemnet.htm/ accessed 10 November 2007.

[163] IMO, International Shipping and World Trade: Facts and Figures. Updated October 2007. IMO Library Services External Relations Office, p. 6-9, 2007.

[164] According MARISEC:

> The flag state plays a critical role with regard to the safety of life at sea and the protection of the marine environment. It is the flag state that has overall responsibility for the implementation and enforcement of international maritime regulations for all ships "flying its flag." Effective regulation by governments of the technical and social aspects of shipping is therefore vital to ensure safe, secure and pollution-free ship operations, and good employment conditions for seafarers.

MARISEC. Shipping Industry Guidelines on Flag State Performance. Published by Maritime International Secretariat Services Limited. Second Edition, p. 6, 2006. Available on: http://www.marisec.org/flag-performance/ accessed 19 November 2007.

As the enforcement of conventions depends upon the Governments of States Party, it is not reasonable to expect a great interest in international agreements that probably will result in high expenses due to the adoption of marine environmental protection measures. Moreover, the Isle of Man and Bermuda, which together have 17 million gross tones of shipping and represent 2.47% of the WMF, are not even member States of IMO,[165] nor are they parties to the CBD.[166] Therefore, it is possible that this current reality, where the majority of vessels are registered in FOC States, affects negatively the entry into force of the BWMC. As previously observed, it is possible and expected that through the GloBallast Partnerships most of these FOC States will ratify the BWC.[167] However, none of the six States[168] that have participated in the first phase of the GloBallast Programme (2000-2004) have yet become Parties to the BWMC.

At the time of this study, eleven States had became contracting parties of the BWMC,[169] which in numeric terms corresponds to a little more than 1/3 of the required 30 States. However, this group represents only 3.46% of the WMF's gross shipping tonnage[170] and, as can be observed in the Table 2, only Norway is part of the top 20 States that possess registers of more than 83% of the merchant vessels in the world and that, consequently, are the States which the Convention mostly depends upon to come into force.

Considering the emphasis the international community places on the issue of invasive species in ballast water, during its meetings the MEPC usually urge States to ratify the BWMC

[165] According to the membership status of IMO available on: http://www.imo.org/dynamic/mainframe.asp?topic_id=315&doc_id=840/ accessed 19 December 2007.

[166] List of States Party to the CBD. Available on: http://www.cbd.int/information/parties.shtml/ accessed on 19 December 2007.

[167] Panama and Bahamas have submitted their endorsements and already became Current Partners of the GloBallast Partnerships. Liberia and the Marshal Islands have been classified as GEF eligible States and thus are able to benefit from GEF funding. Malta and Cyprus are classified as non-GEF eligible States, and thus they are invited to participate in workshops and will be urged to develop strategies and policy reforms, but will have to provide all of their own financing during the GloBallast Partnerships. In: UNDP, Building Partnerships, *op cit*. p. 16-17. All six FOC States together represent 49.53% of the WMF (Table 2) and if the GloBallast Partnerships can motivate them to ratify the BWC, the most significant obstacle to entry into force will be overcome. The only criteria remaining to be satisfied will then be that of 30 States, representing any percentage of the WMF, ratify the Convention.

[168] China, I. R. Iran, India, Ukraine, South Africa, and Brazil.

[169] The eleven States that have already ratified the BWMC are: the Maldives, Saint Kitts and Nevis, the Syrian Arab Republic, Spain (the only one of the eight States that first signed the BWMC), Nigeria, Tuvalu, Barbados, Egypt, Kiribati, Norway, and Sierra Leone.

[170] Report of the MEPC 56th session: 9 - 13 July 2007. Available on: http://www.imo.org/Newsroom/mainframe.asp?topic_id=109&doc_id=7537/ accessed 10 December 2007.

at the earliest opportunity possible. However, it is interesting to note how the entry into force criteria of 35% of the WMF gross tonnage creates a situation where the enforcement of international guidelines to protect the world's coastal marine environments is in the hands of just a few special States.

Table 2. World merchant fleet by country of owner and flag[171]

A) Fleet by country of owner*			B) Fleet by flag**			
Top 20 beneficial ownership countries		%	Top 20 largest shipping flags		Mill GT***	%
1	Greece	18.02	1	Panama	154.9	22.52
2	Japan	14.52	2	Liberia	68.4	9.94
3	Germany	7.89	3	Bahamas	40.8	5.93
4	China	7.22	4	Marshall Island	32.8	4.77
5	United States	5.18	5	Hong Kong (China)	32.6	4.74
6	Norway	5.01	6	Singapore	32.1	4.67
7	Hong Kong (China)	4.84	7	Greece	32.0	4.65
8	South Korea	3.27	8	Malta	24.8	3.61
9	Taiwan (China)	2.69	9	China	23.4	3.40
10	Singapore	2.53	10	Cyprus	19.0	2.76
11	United Kingdom	2.35	11	Norway	14.8	2.15
12	Denmark	2.16	12	Japan	12.7	1.85
13	Russian Federation	1.84	13	Italy	12.5	1.82
14	Italy	1.60	14	United Kingdom	12.1	1.76
15	India	1.52	15	Germany	11.3	1.64
16	Switzerland	1.30	16	United States	11.2	1.63
17	Belgium	1.27	17	South Korea	10.4	1.51
18	Saudi Arabia	1.25	18	Isle of Man	8.6	1.25
19	Turkey	1.13	19	Bermuda	8.4	1.22
20	Islamic Republic of Iran	1.08	20	India	8.3	1.21
Total (top 20 countries)		86.67	Total (top 20 countries)		571.1	83.02
All countries		100.00	All countries		687.9	100.00

*** Based on total deadweight tonnage controlled by parent companies located in these countries. Brazil is the 31st in the list (0.52%). Source: UNCTAD Review of Maritime Transport 2006. Table 16, p. 33.
*** Source: Lloyd's Register Fairplay. World Fleet Statistics, p. 10, 2006.
*** Mill GT = Millions of gross tones of shipping.

Furthermore, according to some specialized shipping websites, a number of States have been reluctant to ratify the BWMC because they do not believe that it is enforceable considering the strict standards for ballast water management and treatment (Standards D-1 and D-2 described in the following pages). The concern regards to the impossibility of success

[171] IMO. International Shipping and World Trade: Facts and Figures, *op cit*. p. 9.

for the flagged vessels to comply with the treatment standards required by the BWMC via the currently technology available. Therefore, in case the BWMC enters into force, the States party would have operational disadvantages compared to non States party, as the obligation to enforce the BWMC provisions could increase the costs for ships voyages. Other significant barriers to ratification include:[172]

- The fact that States normally move slowly when endorsing a new international convention;
- States have a lack of institutional capacity, with maritime ministries having insufficient finances and human resources to implement new ballast water management programs;
- The complex nature and likely expensive cost of technological solutions required for effectively treating ballast water, which require further research and development and globally accepted verification and approval mechanisms; and
- BWM may be assigned a low priority for some coastal nations whose leadership may not be aware of the significant biodiversity and economic implications.

It seems that the first two reasons listed above can help to understand better why Brazil has not yet ratify the BWMC, considering that Brazil was one of the first States to sign the BWMC and that, regarding the third reason, Brazil has no significant importance as a Flag State with respect to the WMF (0.52%). First, it is true that the Brazilian process for passing a new federal law is long, especially when such a law regards environmental protection.[173] The

[172] UNDP, Building Partnerships, *op cit*. p. 6.

[173] For instance, the Federal Law nº 9966 of 28 April 2000, which nationally complements the MARPOL Convention provisions with regard to: the prevention, control, and inspection of the pollution caused by discharges of oil and other hazardous or harmful substances into waters under national jurisdiction. After having been discussed for approximately ten years by the Congress, the correspondent bill of law (known as "Law of Oil") was reviewed and finally approved just after the occurrence of a significant 1,300 m^3 oil spill in the Guanabara Bay (Rio de Janeiro) on 18 January 2000. The spill was caused due to an accident involving a Petrobras oil pipeline connecting the refinery of Duque de Caxias to the terminal of Ilha d'Água. Therefore, a huge oil spill causing serious negative impacts (environmental, economic and social) was necessary to convince the Brazilian Congress to act and approve the law. Two of the main provisions of this law and its subsequent regulations (CONAMA Resolution nº 265 of 27 January 2000; CONAMA Resolution nº 293 of 12 December 2001; and the Federal Decree nº 4136 of 20 February 2002) are: the obligation for ports, oil terminals, oil platforms, oil pipelines, and their support facilities to prepare and implement "individual emergency plans"; and the duty for the environmental agencies to integrate those individual emergency plans into local or regional contingency plans. However, almost eight years after the law has be approved, it is not adequately and totally enforced throughout Brazil.

Brazilian representatives and senators are not dedicated full time to the Congress sessions and also the Congress agenda is frequently obstructed by several "provisional measures"[174] issued by the President for agilely having passed an act that greatly interests the Government but due its controversial nature and resulting political disputes can take a long time to become law.

Considering the second reason enumerated above, it is also true that there is a significant lack of law enforcement capability in Brazil and that one of the main reasons for this is the small number of well qualified inspectors available. Such deficiency occurs in different areas including the environment, health, security, human rights, labor, education, etc. As will be show in the next chapter, the Brazilian Maritime Authority, which is one of the entities responsible for inspecting ships' compliance with ballast water requirements, has around 55 agents to cover at least 44 ports and more than 140 public and private terminals, distributed along 8,698 km of coast line and 12,000 km of continental waterways. Similar limitations have been affecting the ANVISA, which is responsible for the inspection of ships with respect to health surveillance, in other words: to check if ships present a risk of carring pathogenic agents in their ballast water. Both institutions receive BWF from ships in all ports of the country; however, they cannot perform quickly a qualitative analysis of the information given through the BWF due to lack of human resources.

Unfortunately, despite that a large number of Governmental institutions and other organizations have been working for a long time on issues of ballast water management and alien species introduction, the fourth and last reason enumerated above also seems to be present in the case of Brazil. It is true that the State counts with a wide range of applicable legislation regarding environmental protection in general and also specific instruments related to coastal and marine areas. On the other hand, as noted above, the unawareness about the implications of untreated ballast water discharges and the consequent low priority given by the Brazilian leadership to this issue reflects on the large lack of enforcement for such legislation, mainly due to insufficient human resources and lack of training and support.

[174] The provisional measures (Medida Provisória - MP) correspond to a very controversial type of normative act in Brazilian legislation. The MPs have force of law and become effective just after their publication by the President, even before being approved by Congress and converted into law. This instrument should be used only in case of "urgency and importance" of the related matter, but the definitions of such qualities can be largely debatable. Thus, political disputes in the congress regarding the approval of very controversial MPs can impossibility the appreciation of other bills in a short time and this situation has been frequent in Brazil.

At present, IMO Conventions enter into force within an average of five years after adoption.[175] However, it would be reasonable to expect that this interval of time between the adoption and entry into force of a convention became shorter as time passes[176] since more and more advanced technologies and nautical engineering techniques are available. These are exactly the same technologies and techniques that the shipping industry has been continually financing and applying to promote a positive image worldwide after the construction and release of bigger, faster, and more lucrative ships.

2.5.4.2 The D-1 and D-2 Standards

In addition to the important provisions of the IMO Resolution A.868(20)/1997 previously outlined, the other main provisions of the BWMC established two different standards to be satisfied by the shipping industry: the first is a standard for ballast water exchange, and the second is based on ballast water quality:[177]

- D-1 Standard (Ballast Water Exchange Standard) - to fulfill this regulation ships must exchange at least 95% of their ballast water volume. If the exchange is performed through the pumping-through method, the exchange of three times the volume of each ballast tank is considered enough. Pumping through less than three times the volume may be accepted if the ship demonstrates that at least the 95% volumetric exchange is achieved; and
- D-2 Standard (Ballast Water Performance Standard) – to comply with this regulation, the ships' BWM must result in discharges of ballast water with less than 10 viable organisms per cubic meter greater than or equal to 50 micrometers in minimum dimension and less than 10 viable organisms per milliliter less than 50 micrometers in minimum dimension and greater than or equal to 10 micrometers in minimum dimension; and discharge of the indicator microbes shall not exceed the following specified concentrations: 1 Toxicogenic *Vibrio cholerae* (O1 and O139) with less than

[175] IMO website, available on: http://www.imo.org/Conventions/mainframe.asp?topic_id=148/ accessed 12 December 2007.
[176] According the "Status of Conventions Summary" available on IMO website, the first convention to be adopted by IMO was the IMO Convention on 6 March 1948, which came into force eleven years afterwards on 17 March 1958; and the last IMO Convention to enter into force was the SALVAGE Convention on 14 July 1996, seven years after its adoption on 28 April 1989.
[177] Section D (Standards for Ballast Water Management) p. 22 of Annex of BWMC.

1 colony forming unit (cfu) per 100 milliliters or less than 1 cfu per 1 gram (wet weight) zooplankton samples, 2 *Escherichia coli* less than 250 cfu per 100 milliliters, 3 Intestinal Enterococci less than 100 cfu per 100 milliliters.

According the Regulation B-3 (Ballast Water Management for Ships) of the BWMC, depending on their ballast capacity and date of construction, the ships have different time limits to fulfill the requirements. The idea is to allow the shipping industry to achieve the standards progressively along the years,[178] expecting that by 2017 all ships engaged in world maritime commerce will meet the most exigent D-2 standard. Therefore, it must be noted that ballast water exchange (D-1) should be only a risk reducing measure of limited duration (2016 for some class of ships).[179] The Table 3 bellow summarizes the original deadlines specifically established in 2004 for each class of ship to meet the D-1 and D-2 standards.

Table 3. Application dates of the IMO Ballast Water Management Convention[180]

Construction Date	Ballast Capacity (m^3)	Year to BWM meet the standards									
		2004-2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
< 2009	≥ 1500 and ≤ 5000	D-1 or D-2							D-2		
	< 1500 or > 5000	D-1 or D-2									D-2
≥ 2009	< 5000		D-2								
≥ 2009 and < 2012	≥ 5000		D-1 or D-2								D-2
≥ 2012						D-2					

According to this regulation, a ship constructed before 2009 shall also meet the standards no later than the first intermediate or renewal survey, whichever occurs first, after the anniversary date of delivery of the ship in the year of compliance with the standard applicable to the ship. The average age of the world fleet at the end of 2006 was about 12 years.[181]

However, at its recent 25th Assembly meeting held in November 2007, IMO postponed the first enforcement of the D-2 standard from 2009 to 2012 (Table 4) due the expected

[178] Considering that the BWMC was adopted in 2004, the shipping industry was originally provided with 13 years to implement standards that could reduce the ballast water impacts.
[179] ICES Advisory Committee on the Marine Environment. ICES WGBOSV Report 2006, *op cit*. p. 12.
[180] Table modified from Agenda 6 (OSPAR 07/6/7-E) of the Meeting of the OSPAR Commission, Ballast Water Management Strategy for North West Europe - Voluntary Ballast Water Guidelines for Vessels Entering the OSPAR Region. Presented by the United Kingdom, p. 8, Annex 1, June 2007.
[181] By vessel type: 9.1 years for container ships, 10 years for tankers, 12.9 years for bulk carriers, and 17.4 years for general cargo vessels. In: UNCTAD, Review of Maritime Transport 2007. Report by the UNCTAD Secretariat, United Nations, New York and Geneva, p. 24, 2007.

unavailability of an ideal ballast water treatment system until 2009. An ideal treatment system should satisfy all the criteria previously indicated as acceptable to the shipping industry, mainly the one regarding the private costs of its implementation and use. This two year delay may not seem too much, but there is no guarantee that it will completely satisfy the need for such ideal treatment system being developed and it is possible that another delay will be granted.

Table 4. New application dates of the IMO Ballast Water Management Convention[182]

<table>
<tr><th rowspan="2">Construction Date</th><th rowspan="2">Ballast Capacity (m^3)</th><th colspan="10">Year to BWM meet the standards</th></tr>
<tr><th>2004-2008</th><th>2009</th><th>2010</th><th>2011</th><th>2012</th><th>2013</th><th>2014</th><th>2015</th><th>2016</th><th>2017</th></tr>
<tr><td rowspan="2">< 2009</td><td>≥ 1500 and ≤ 5000</td><td colspan="7">D-1 or D-2</td><td colspan="3">D-2</td></tr>
<tr><td>< 1500 or > 5000</td><td colspan="9">D-1 or D-2</td><td>D-2</td></tr>
<tr><td>≥ 2009</td><td>< 5000</td><td></td><td colspan="3">D-1 or D-2</td><td colspan="6">D-2</td></tr>
<tr><td>≥ 2009 and < 2012</td><td rowspan="2">≥ 5000</td><td></td><td colspan="8">D-1 or D-2</td><td>D-2</td></tr>
<tr><td>≥ 2012</td><td colspan="4"></td><td colspan="6">D-2</td></tr>
</table>

The BWMC was adopted after many years of underlining the serious concerns regarding ballast water and the safety of the marine environment. Its provisions represent not only the result of the continuous development of the first 1991 international guidelines, but also an agreement reached between IMO, member States, scientists, and shipping industry representatives. In conclusion, this delayed decision has resulted in a great disappoint for those who have been waiting for a long time for the enforcement of more strict and effective regulations that could benefit the marine environment and all the people and activities associated with it. This decision can certainly support the initiatives already taken by some States in not waiting for the ratification or entry into force of the BWMC and adopting more strict regulations on BWM at the national level.

2.5.4.3 Ballast Water Exchange

Since before the first guidelines adopted by IMO in 1991 through Resolution MEPC 50(31), open ocean exchange is considered the most important measure for managing ballast water from ships.[183] The criteria for ships performing open ocean exchange of ballast water in

[182] Table modified from the Agenda 6 (OSPAR 07/6/7-E) of the Meeting of the OSPAR Commission, *op cit*.
[183] Section 7.3 of the Resolution MEPC 50(31) *op cit*.

order to meet the D-1 standard follows the recommendations previously made by Resolution A.868(20)[184] and is described by regulation B-4 of the BWMC. Therefore, ships shall:

> whenever possible, conduct such ballast water exchange at least 200 nautical miles from the nearest land and in water at least 200 meters in depth, taking into account the Guidelines developed by the Organization;[185]
>
> in cases where the ship is unable to conduct ballast water exchange in accordance with paragraph 1.1, such ballast water exchange shall be conducted taking into account the Guidelines described in paragraph 1.1 and as far from the nearest land as possible, and in all cases at least 50 nautical miles from the nearest land and in water at least 200 meters in depth.[186]

As previously outlined, this measure is based on the premise that organisms from coastal waters, estuaries and rivers are unable to survive in open ocean waters where the sea water characteristics (salinity, temperature, transparency, nutrients concentration, etc) differ greatly from those of waters that exist in their places of origin. Similarly, it is expected that marine organisms from oceanic waters far from shore will not survive when released into coastal waters, estuaries or rivers. Considering salty, brackish, and fresh waters, the Table 5 below shows the expected probability of survival for most aquatic organisms and pathogens after being transferred through ballast water.

Table 5. Probability of organism survival and reproduction[187]

Discharged ballast / Receiving waters	Fresh water	Brackish water	Saline water
Fresh water	**High**	**Med**	**Low**
Brackish water	**Med**	**High**	**High**
Saline water	**Low**	**High**	**High**

Thus, open ocean exchange is a measure that cannot effectively eliminate all risks of biological invasions since the probability of survival for the organisms present in ballast water will always exist, even when considered low. Even if the ballast water exchange is correctly performed it is still expected that 5% of the original ballast water will remain inside the tanks,

[184] *Ibid*. Section 9.2.1.
[185] According Paragraph 1.1 of regulation B-4 of the BWMC, Organization means the IMO.
[186] Paragraph 1.2 of the regulation B-4 of the BWMC.
[187] Section 4.6 of the Resolution MEPC 50(31) *op cit*.

which might be sufficient to make possible the transfer of alien species. Furthermore, carrying out of the open ocean exchange is not always possible due to operational restrictions and safety aspects of ships. Such limits are also considered by regulation B-4 of the BWMC, which establishes that:

> A ship conducting ballast water exchange shall not be required to comply with paragraphs 1 or 2, as appropriate, if the master reasonably decides that such exchange would threaten the safety or stability of the ship, its crew, or its passengers because of adverse weather, ship design or stress, equipment failure, or any other extraordinary condition.[188]

Additionally, the same regulation establishes that a ship shall not be required to deviate from its intended voyage, or delay the voyage, in order to comply with the ballast water exchange.[189] Due to these many restrictions to open ocean exchange, the potential ballast water volume that can be exchanged is not necessarily equal to the volume uptake in ports by ships.[190]

The period necessary a larger ship to perform ballast water exchange varies, but in general it is up to 2 days.[191] Considering the characteristics of the ships' voyages (routes and traffic) and weather conditions, it has been estimate that 30% of the ships will not be able to perform an open ocean exchange if 2 days are needed.[192] Considering these aspects, it is expected that at least 10% of the loaded international ballast water will not be exchanged in the open sea.[193] Moreover, depending on the countries' specific maritime trade characteristics, the ballast water exchange in the open ocean would have different implications as a management measure. For example, about 60% of the traffic in North Atlantic operates within 200 nm from shore at any given time,[194] and in 2003 around 65% of ships arriving in the U.S. from foreign ports did not travel more than 200 nm from the coast line.[195]

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[188] Paragraph 4 of the regulation B-4 of the BWMC.
[189] *Ibid*. Paragraph 3.
[190] Øyvind Endresen *et al*, Challenges, *op cit*. p. 615–623.
[191] *Ibid.*
[192] *Ibid.*
[193] *Ibid.*
[194] *Ibid*. p. 618; Estimated through global traffic data from Amver, a computer-based and voluntary global ship reporting system sponsored by the USCG, available on http://www.amver.com/; accessed 25 November 2007.
[195] U.S. Department of Homeland Security, Shipping Traffic Analysis and Cost Assessment for Ballast Water Exchange en Route to the United States - an analysis revisited, 2004. In: Robin M. Nazzaro, Invasive Species:

Another concern is the hydrodynamic characteristics of the location where the ballast water exchange would be undertaken. As describe by regulation B-4 of the BWMC, in some cases the ballast water exchange could be performed closer than 200 nm from the nearest coastline. Thus, would also exist the possibility of organisms present in the ballast water be transported by surface currents to the nearby coasts.[196] Finally, it is important to recall that significant differences between the salinities of coastal and open ocean environments are not always a rule; and also that many marine organisms, mainly those typically found in estuaries,[197] are capable of surviving the stress caused by salinity variations.

Consequently, this measure must be considered only as a palliative and temporary alternative to be substituted as soon as possible by efficient on-board ballast water treatment systems.

2.5.4.4 Guidelines of the BWMC

Considering the need for the effective implementation and uniform interpretation of its provisions, the BWMC also established that States party should implement its provisions taking into account the Guidelines developed by the IMO. Currently, the following 14 guidelines have already been adopted in the Convention by the MEPC sessions:

- (G1) Sediment reception facilities;[198]
- (G3) Ballast water management equivalent compliance;[199]
- (G4) Ballast water management and development of ballast water management plans;[200]
- (G5) Ballast water reception facilities;[201]
- (G6) Ballast Water Exchange;[202]
- (G7) Risk assessment under Regulation A-4 of the BWMC;[203]

Progress and Challenges in Preventing Introduction into U.S. Waters Via the Ballast Water in Ships. Director, Natural Resources and Environment. GAO-05-1026T. p. 14-15, 2005.

[196] A.C. Anil *et al*, Marine Bioinvasion: An Overview. National Institute of Oceanography, Dona Paula, Goa 403 004, India. Available on: http://drs.nio.org/drs/bitstream/2264/166/3/gbwmp_1st_rd_4.pdf/; accessed 20 April 2007.

[197] According the UN Atlas of the Oceans *op cit*., in general, estuary salinity can potentially vary from 0-35 according the tide regime and amount of freshwater input.

[198] Resolution MEPC.152(55) adopted on 13 October 2006.

[199] Resolution MEPC.123(53) adopted on 22 July 2005.

[200] Resolution MEPC.127(53) adopted on 22 July 2005.

[201] Resolution MEPC.153(55) adopted on 13 October 2006.

[202] Resolution MEPC.124(53) adopted on 22 July 2005.

- (G8) Approval of ballast water management systems;[204]
- (G9) Procedure for approval of ballast water management systems that make use of active substances;[205]
- (G10) Approval and oversight of prototype ballast water treatment technology programmes;[206]
- (G11) Ballast water exchange design and construction standards;[207]
- (G12) Design and construction to facilitate sediment control on ships;[208]
- (G13) Additional measures regarding ballast water management including emergency situations;[209]
- (G14) Designation of areas for ballast water exchange;[210] and
- Ballast water exchange in the Antarctic Treaty Area.[211]

The remaining implementing document, "Guidelines for ballast water sampling" (G2), has been developed by the Ballast Water Working Group of MEPC's Sub-Committee on Bulk Liquids and Gases (BLG), and is expected that it will be discussed at the 12th session of the BLG in 2008.

2.5.4.5 Provisions of the BWMC that addresses port areas

With respect to BWM measures that could be related to port areas, the points of the BWMC that directly concern the Brazilian port authorities include:[212]

> 1 - Each Party shall, with due regard to its particular conditions and capabilities, develop national policies, strategies or programmes for BWM in its ports and waters under its jurisdiction that accord with, and promote the attainment of the objectives of this Convention;[213]
>
> 2 - Each Party undertakes to ensure that, in ports and terminals designated by that Party where cleaning or repair of ballast tanks occurs, adequate facilities are provided for the reception of Sediments, taking into account the Guidelines developed by the Organization. Such reception facilities shall operate without causing undue delay to ships and shall provide for the safe disposal of such

[203] Resolution MEPC.162(56) adopted on 13 July 2007.
[204] Resolution MEPC.125(53) adopted on 22 July 2005.
[205] Resolution MEPC.126(53) adopted on 22 July 2005.
[206] Resolution MEPC.140(54) adopted on 24 March 2006.
[207] Resolution MEPC.149(55) adopted on 13 October 2006.
[208] Resolution MEPC.150(55) adopted on 13 October 2006.
[209] Resolution MEPC.161(56) adopted on 13 July 2007.
[210] Resolution MEPC.151(55) adopted on 13 October 2006.
[211] Resolution MEPC.163(56) adopted on 13 July 2007.
[212] Luciola Perez de Almeida and Alexandre de Carvalho Leal Neto, Convenção, *op cit*. p. 3.
[213] Article 4, BWMC.

> Sediments that does not impair or damage their environment, human health, property or resources or those of other States;[214]
>
> 3 - Parties shall endeavour, individually or jointly, to (a) promote and facilitate scientific and technical research on BWM; and (b) monitor the effects of BWM in waters under their jurisdiction. Such research and monitoring should include observation, measurement, sampling, evaluation and analysis of the effectiveness and adverse impacts of any technology or methodology as well as any adverse impacts caused by such organisms and pathogens that have been identified to have been transferred through ship's Ballast Water;[215] and
>
> 4 - A Party shall endeavour to notify mariners of areas under their jurisdiction where ships should not uptake Ballast Water due to known conditions. The Party shall include in such notices the precise coordinates of the area or areas, and, where possible, the location of any alternative area or areas for the uptake of Ballast Water. Warnings may be issued for areas: (1) known to contain outbreaks, infestations, or populations of Harmful Aquatic Organisms and Pathogens (e.g., toxic algal blooms) which are likely to be of relevance to Ballast Water uptake or discharge; (2) near sewage outfalls; or (3) where tidal flushing is poor or times during which a tidal stream is known to be more turbid.[216]

Taking into account the first point, it is necessary to affirm that the singly requirement for ships exchanging their ballast water at open ocean waters is not sufficient to promote the attainment of the BWMC objectives since they include:

> prevent, minimize and ultimately eliminate the risks to the environment, human health, property and resources arising from the transfer of Harmful Aquatic Organisms and Pathogens through the control and management of ships Ballast Water and Sediments, as well as to avoid unwanted side-effects from that control and to encourage developments in related knowledge and technology.[217]

As previously noted, the open ocean exchange should be considered at most only as a palliative measure that may minimize the risks related to ballast water discharges, but cannot fully prevent or eliminate them. Both these last concepts assume stopping something from happening and, as discussed above, this cannot be achieved even when the exchanges are undertaken precisely as prescribed by the BWMC and its specific guidelines. To really reach the goals, other actions must be applied, some of which are stipulated by the BWMC.

[214] Article 5, BWMC.
[215] Article 6, BWMC.
[216] Regulation C-2, Annex, BWMC.
[217] BWMC, p. 2.

Regarding the second point, in reality it does not directly address the participation of port authorities in the process of BWM. The repair, cleaning and removal of sediment from ballast tanks correspond to regular maintenance services of ships, and as any other similar services they are more appropriately executed at shipyard's dry docks.[218] Therefore, shipyards that clean and repair ballast tanks must be provided with adequate reception facilities for the sediments they remove.[219]

With respect to the Brazilian ports, the great majority of them do not permit any kind of vessel maintenance services in the same areas where port operations involving cargo handling happen. Moreover, as such services are considered as necessary maintenance for ships, the time required for their completion could not be deemed as a delay for ships' voyages. This is different from any delays resulting from the performance of open ocean exchanges of ballast water or any inspection activity including ballast water sampling while ships are anchored or berthed in port areas. The costs and time necessary for the execution of these services would be the object of negotiations between the representative of the ships and the administration of the shipyard, and compensations for fortoituals delays in the predicted timeline would be the object of contractual terms.

In Brazil, once a shipyard offers such services, its compulsory environmental license[220] would prescribe the adoption of all measures necessary for the correct and environmentally safe implementing of operations to clean the tanks and to remove, package, transport, and treat at a final destination the sediment. All these steps will automatically have to follow the specific regulation addressed to ships residues management.

The same way as a port provides information to ships on the availability of a diverse range of port services, the existence of a shipyard or other type of specific facility able to perform such services could be advertised prior to the arrival of ships. Moreover, a list with all information on these facilities could be part of a proper database to be maintained by the same national clearinghouse on alien species. Such a database could be fed by information provided through the receiving of specific forms on sediment disposal from ballast tanks, similar to the BWRF.

[218] Luciola Perez de Almeida and Alexandre de Carvalho Leal Neto, Convenção, *op cit*. p. 4.
[219] ICES Advisory Committee on the Marine Environment. ICES WGBOSV Report 2006, *op cit*. p. 84.
[220] Since this type of business is considered a potentially polluting activity.

Besides the implementation of ballast water treatment systems on board ships, as considered by the third point outlined above, it is essential that the States conduct scientific and technical research on BWM and also implement monitoring programs for alien species and their environmental effects. As the ports are the potential hotspots for the import and export of alien species, it is obvious that such monitoring programs must be mainly applied in their areas.

Usually, the presence of alien species in aquatic environments is only broadly revealed or a subject of concern when such organisms are already well adapted and spread in the new environment and/or due the negative impacts caused by them.[221] Therefore, monitoring programs are necessary to allow a quick detection of new alien species introductions, which in turn can make possible the adoption of prompt response measures for their control and/or eradication. However, in most cases when an alien species become established in the environment its eradication would be virtually impossible. In this case, the single alternative would be controlling the population of these species in order to maintain the impacts and losses at acceptable levels.[222] Considering that in aquatic environments alien species can easily spread and cause unwanted effects in a short period, it is only through monitoring programs, mainly in ports areas, that States could have the information and develop the necessary tools to truly and successfully implement a ballast water management system. As the distribution and behavior of organisms can vary greatly according to the season, monitoring would also have to be permanent.[223]

Therefore, monitoring programs in port areas are essential for assessing the risks and measuring the impacts associated with alien species introductions. Their execution is also important for checking the efficiency of controlling actions once they are implemented. However, monitoring new alien species is not simple to do since their presence is often not easily detected in the initial period just after their introduction.[224] Consequently, the monitoring programs need to be very well planned, developed and effectively implemented. Moreover, it is important that the data obtained locally in all ports can be integrated by a

[221] Stefan Nehring *et al*, Alien species in the Wadden Sea - A challenge to act. Wadden Sea Newsletter, p. 13-16, 2005.
[222] *Ibid.*
[223] Øyvind Endresen *et al*, Challenges, *op cit*. p. 621.
[224] Stefan Nehring *et al*, Alien species in the Wadden Sea, *op cit*.

national clearinghouse on aquatic alien species, which could present a panoramic and holistic view of the problem that could facilitate and make more efficient the decision-making process for adopting joint actions between different ports and other local and national institutions involved. These goals also make it necessary for the implementation of monitoring programs in all ports to follow the same standard procedures and methods. Thus, the national clearinghouse could also allow the State to join an international harbor monitoring network and database regime, indicated as necessary to make risk assessment a viable alternative.[225]

Finally, regarding the fourth point, port surveys continually updated through monitoring programs can be used for defining all appropriate and inappropriate areas for up taking and discharging of ballast water into ports regions or areas under its direct influence. Once such areas are defined and information is provided for the ships, the uptake of harmful aquatic organisms, pathogens and sediments that may contain such organisms can be minimized. Hence, not only the local environment could be better preserved or recovered, but also all subsequent port areas present in the itinerary of ships.

2.6 Concluding Remarks

Chapter 2 presented a general overview of the international framework for BWM, showing that many actions and discussions have been undertaken (mainly by IMO States Party) for many years, but significant progress is still necessary. Chapters 3 and 4 will focus on the national level through a review of the specific approaches taken by the United States and the EU with respect to the ballast water problem in order to outline measures and initiatives that could be useful for the Brazilian approach. Chapter 3 includes a description of the main legislative instruments that the U.S. Government currently counts on to regulate the matter and the role of the principal institutions involved with BWM. Through this review, this study aims to create a different referential basis that could be used as comparative models to what have been realized in Brazil to manage the problem. This aspect will be presented in Chapter 5.

[225] Øyvind Endresen *et al*, Challenges, *op cit*. p. 619.

Chapter 3 The US Control and Management of Ballast Water

According to the American Association of Port Authorities (AAPA), "almost 99% of U.S. overseas trade is moved by ship and over 80 million tons of ballast water is discharged into U.S. waters each year from foreign ports."[226] The U.S. public authorities first paid attention to ballast water as a significant source of invasive species due to the impacts caused by zebra mussels in city water supplies and electric utilities in the Great Lakes region.[227] The zebra mussel (*Dreissena polymorpha,* Pallas, 1769) arrived in the Great Lakes in the late 1980s and since then many studies have been documented great impacts and economic losses caused by its introduction, as well as the impacts caused by many other alien species along the U.S. coastal and inland waters.[228]

[226] American Association of Port Authorities (AAPA), available on: http://www.aapa-ports.org/Issues/USGovRelDetail.cfm?ItemNumber=880/ accessed 19 August 2007. However this estimation would be out of date since is based on data collected in 1991, in: James T. Carlton, *et al*, Shipping Study: The role of shipping, *op cit*. p. xix. According this study, in terms of acknowledged ballast received from three ship types (tankers, bulk cargo vessel, general cargo), the five main importing ballast water ports in the U.S. would be New Orleans (13,484,000), Norfolk (9,325,000), Los Angeles/Long Beach (5,878,000), Houston (3,239,000), and Baltimore (2,834,000).

[227] Eugene H. Buck, Ballast Water Management, *op cit*. p. 1.

[228] Hank Vanderploeg, The Zebra Mussel Connection: Nuisance Algal Blooms, Lake Erie Anoxia, and other Water Quality Problems in the Great Lakes. NOAA, Great Lakes Environmental Research Laboratory, Ann Arbor, MI, 2002; Andrew N. Cohen and James T. Carlton, Nonindigenous Aquatic Species in a United States Estuary: a Case Study of the Biological Invasions of the San Francisco Bay and Delta. A Report for the United States Fish and Wildlife Service, Washington D. C. 1995; Catherine E. deRivera *et al*, Broad-Scale Nonindigenous Species Monitoring along the West Coast in National Marine Sanctuaries and National Estuarine Research Reserves. Report to National Fish & Wildlife Foundation, 2005; Steven McGee *et al*, Analysis of recent vessel arrivals and ballast water discharge in Alaska: Toward assessing ship-mediated invasion risk. Marine Pollution Bulletin, v. 52, p. 1634-1645, 2006; Gary L. Ray, Invasive Marine and Estuarine Animals of Hawai'i and other Pacific Islands. ERDC/TN ANSRP-05-3, 19 pp. 2005; Gary L. Ray, Invasive Marine and Estuarine Animals of the Gulf of Mexico. ERDC/TN ANSRP-05-4, 11 pp. 2005; Gary L. Ray, Invasive Marine and Estuarine Animals of the Pacific Northwest and Alaska. ERDC/TN ANSRP-05-6, 18 pp. 2005; Andrew N. Cohen and Brent Foster, The Regulation of Biological Pollution: Preventing Exotic Species Invasions from Ballast Water Discharged into California Coastal Waters. Coastal Law Symposium, Golden Gate University Law Review v. 30(4), p. 787-883, 2000; Christopher Costello *et al*, Evaluating an Invasive Species Policy: Ballast Water Exchange in the Great Lakes. Ecological Applications, v. 17(3), p. 655–662, 2007; Arthur J. Niimi and Donald M. Reid, Low salinity residual ballast discharge and exotic species introductions to the North American Great Lakes. Marine Pollution Bulletin, v. 46, p. 1334-1340, 2003; James T. Carlton, Pattern, Process, and Prediction in Marine Invasion Ecology. Biological Conservation, v. 78, p. 97-106, 1996; Mark S Minton *et al*, Reducing propagule supply and coastal invasions via ships: effects of emerging strategies. Research Communications, The Ecological Society of America, p. 304-308, 2005; Gregory M. Ruiz and David F. Reid, Current State of Understanding about the Effectiveness of Ballast Water Exchange (BWE) in Reducing Aquatic Nonindigenous Species (ANS) Introductions to the Great Lakes Basin and Chesapeake Bay, USA: Synthesis and Analysis of Existing Information. NOAA Technical Memorandum GLERL-142, xiv + 127 pp. 2007; etc.

The potential economic disruption to communities affected by the zebra mussel due to its colonization in water pipes, boat hulls and other hard surfaces has been estimated at $5 billion by the year 2000.[229] However, although this value is the single most quoted figure of economic impact of an aquatic introduction in the U.S., it is not based upon a study.[230] In fact, according to the U.S. Government Accountability Office (GAO), the zebra mussel alone is estimated to have caused $750 million to $1 billion in damages between 1989 and 2000,[231] which still represents a significant loss. In 1999, it was estimated that approximately 50,000 foreign species have already invaded all types of environments in the U.S., causing at that time an economic impact of more than U$138 billion per year.[232] Figure 8 below demonstrates the current distribution of zebra mussel and another similar invasive alien species called quagga mussel (*Dreissena bugensis*, Andrusov, 1897) in U.S. waters.

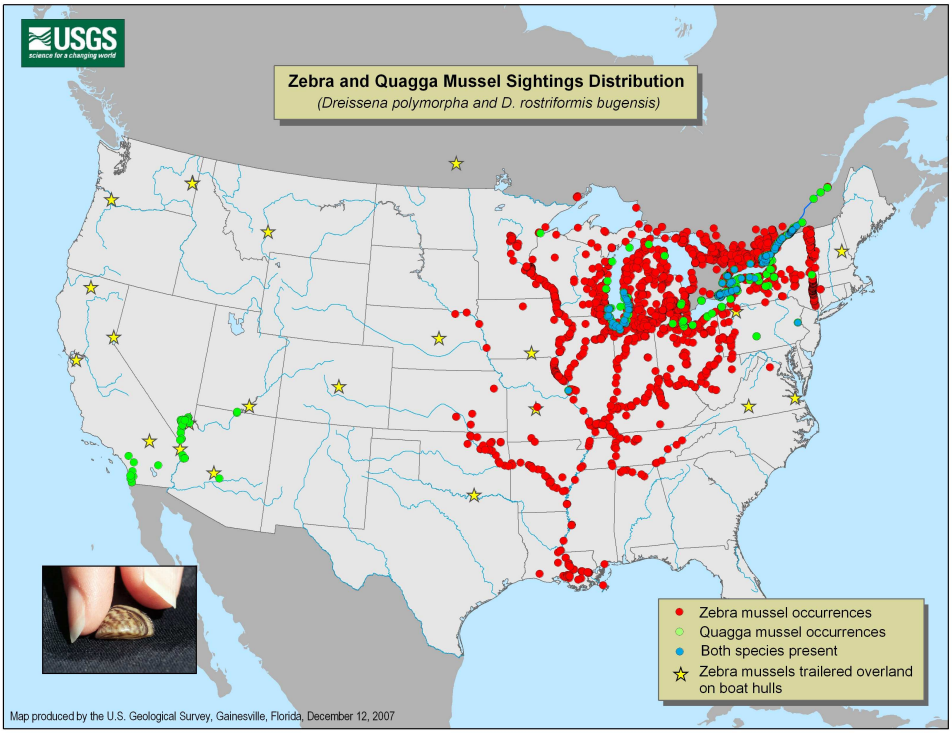

Figure 8. Zebra and Quagga Mussels Sightings Distribution in U.S.[233]

[229] Section 1002 (a) (4) of the Nonindigenous Aquatic Nuisance Prevention and Control Act (NANPCA), 1990.
[230] This value is called an "urban legend" by James T. Carlton in "Introduced Species in U.S. Coastal Waters: Environmental Impacts and Management Priorities" prepared for the Pew Oceans Commission. Williams College and Mystic Seaport. p. 5, 2001.
[231] Robin M. Nazzaro, Invasive Species, *op cit*. p. 1.
[232] David Pimentel *et al*, Environmental and Economic Costs Associated with Non-Indigenous Species in the United States. BioScience, v. 50(1), p. 53-65, 2000.
[233] Source: USGS, available on: http://nas.er.usgs.gov/taxgroup/mollusks/zebramussel/ accessed 05 January 2008.

Currently, the National Center for Research on Aquatic Invasive Species of the U.S. National Oceanic and Atmospheric Administration (NOAA) compiled a list with all aquatic non-indigenous species found in the Great Lakes. This list includes 185 species, of which 58 were probably introduced through ballast water, 2 are questioned on whether or not they were introduced through ballast water, 13 would have arrived through solid ballast, 2 exclusively through other ways related to shipping. The other 89 species on the list were introduced by aquarium and bait release, canals, railroads and highways, deliberate release, and unintentional release; 21 species have not been associated to a vector.[234]

3.1 U.S. Approach on BWM

Due to the significant environmental and economic impacts caused by the zebra mussel in the Great Lakes region, both the U.S. and Canadian Governments were some of the first to initiate studies and adopt not just voluntary but compulsory measures for the management of discharges of ballast water by ships. In this sense, the U.S. was one of the first countries to approve specific laws on this issue. This section presents the main legal documents that regulate ballast water management in the U.S., outlining the compulsory measures and the mandate of agencies and other institutions involved.

3.1.1 Nonindigenous Aquatic Nuisance Prevention and Control Act (1990)

To deal with the zebra mussel problem, as well as to reduce the introduction of species in the Great Lakes, the U.S. Congress approved in 1990 the Nonindigenous Aquatic Nuisance Prevention and Control Act (NANPCA).[235] This Act was the first legislation in the U.S. that addressed ballast water concerns[236] and required the U.S. Coast Guard[237] (USCG) to

[234] NOAA, National Center for Research on Aquatic Invasive Species, available on: http://www.glerl.noaa.gov/res/Programs/invasive/ accessed 19 August 2007.
[235] Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990. As Amended Through P.L. 106–580, Dec. 29, 2000.
[236] Eugene H. Buck, Ballast Water Management, *op cit*. p. 4; and U.S. Commission on Ocean Policy. An Ocean Blueprint for the 21st Century. Final Report. Chapter 17 – Preventing the Spread of Invasive Species. p. 252-263. Washington, DC, 2004.
[237] Webpages of the USCG related to BWM and invasive alien species available on: http://www.uscg.mil/hq/g-m/mso/bwm.htm/; http://www.uscg.mil/hq/g-m/mso/esn.htm/; and http://www.uscg.mil/hq/g-m/mso/ans.htm/.

hurriedly[238] establishes voluntary guidelines to prevent the introduction and spread of aquatic nuisance species into the Great Lakes.

Two years after the enactment of NANPCA, the USCG, in consultation with the Aquatic Nuisance Species Task Force (ANSTF), published a final rule in the Federal Register (58 FR 18330) and turned the voluntary guidelines into mandatory BWM procedures for the Great Lakes.[239] As the subsequent BWMC, the central measure adopted by NANPCA for BWM is ballast water exchange in open ocean waters. Therefore, all vessels equipped with ballast water tanks sailing to a U.S. port on the Great Lakes, after transiting through the waters beyond the Exclusive Economic Zone (EEZ),[240] must exchange their ballast water prior to entering those waters.[241]

The NANPCA also indicated alternatives for ships that could not perform the ballast water exchange beyond the EEZ. One of them should be the ballast water exchange may take place in the nearest coastal waters as long as the procedure does not pose a threat of infestation or spread of aquatic nuisance species in the Great Lakes and other waters of the United States.[242]

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[238] Section 1101 (Aquatic Nuisance Species in Waters of the United States) of NANPCA.

[239] Appendix L - Title 33 CFR, Part 151, Subpart C: ''Ballast Water Management for Vessels Entering the Great Lakes'' that later became Subpart D: "Ballast Water Management for Control of Non-Indigenous Species in Waters of the United States". Authority: 16 U.S.C. 4711; Department of Homeland Security Delegation n° 0170.1.

[240] Exclusive Economic Zone (EEZ) means the area established by Presidential Proclamation Number 5030 (10/03/1983) which extends from the base line of the territorial sea of the United States seaward 200 nm, and the equivalent zone of Canada.

[241] First as voluntary guidelines through Section 1101 (Aquatic Nuisance Species in Waters of the United States), (a) (1) of the NANPCA; and then as a mandatory procedure through Paragraph 151.1510 (Ballast water management) of the Title 33 (Navigation and Navigable Waters) CFR, Part 151 (Vessels carrying oil, noxious liquid substances, garbage, municipal or commercial waste, and ballast water):

> (a) The master of each vessel subject to this subpart shall employ one of the following ballast water management practices:
>
> (1) Carry out an exchange of ballast water on the waters beyond the EEZ, from an area more than 200 nautical miles from any shore, and in waters more than 2,000 meters (6,560 feet, 1,093 fathoms) deep, prior to entry into the Snell Lock, at Massena, New York, or prior to navigating on the Hudson River, north of the George Washington Bridge, such that, at the conclusion of the exchange, any tank from which ballast water will be discharged contains water with a minimum salinity level of 30 parts per thousand.

[242] According to Section 1102 (a) (1) of NANPCA the ANSTF would be responsible to carry out through studies to identify these other areas where the exchange of ballast water could be carried out without causing a threat of infestation or spread of aquatic nuisance species in the Great Lakes and other waters of the U.S.

However, it seems that these alternative ballast water exchange zones would have not yet been established by the federal Government.[243]

Other alternative BWM methods can be used if the USCG determines that such methods are as effective as ballast water exchange in preventing and controlling infestations of aquatic nuisance species. To be authorized to operate in the Great Lakes the master of the vessel must demonstrate to the USCG that the requirements of the regulations have been complied before entering its waters.[244] In any case, implementing of these requirements must guarantee the safety of each vessel, their crew and passengers.

One of the very interesting provisions of NANPCA was the establishment of the above mentioned ANSTF, which is composed of representatives from 10 Federal agencies[245] and 12 Ex-officio members. The ANSTF's main responsibility is to:

> develop and implement a program for waters of the United States to prevent introduction and dispersal of aquatic nuisance species; to monitor, control and study such species; and to disseminate related information."[246]

The latest ANSTF's Strategic Plan for 2007-2012 has as its primary goals:[247]

- Developing strategies to identify and reduce the risk of harmful aquatic species being introduced into waters of the United States;
- Minimizing the harmful effects of ANS already introduced into the waters of the United States;
- Facilitating research to address the threat and harmful effects of ANS;
- Increasing public understanding of the importance of reducing the introduction, spread, and impact of ANS and recommending appropriate domestic and international actions; and
- Maximizing the organizational effectiveness of the ANSTF.

[243] ICES, Report of the Working Group on Introductions, 2007, *op. cit*. p.114-115.
[244] It must be done before the vessel's departure from the first lock in the St. Lawrence Seaway. Section 1102 (b); (2); (E) of NANPCA.
[245] Section 1201 (Establishment of Task Force) of NANPCA. ANSTF is composed of: U.S. Fish and Wildlife Service; U.S. Dept of Commerce/NOAA; U.S. Department of Transportation / Maritime Administration (Office of Environmental Activities); Stewardship and Science National Park Service; U.S. Coast Guard; U.S. Army Corps of Engineers; U.S. Environmental Protection Agency (EPA); Environmental Services USDA-APHIS; U.S. Department of State (Office of Ocean Affairs); and U.S. Geological Survey. Available on: http://www.anstaskforce.gov/
[246] Section 1102 (National Ballast Water Management Information), NANPCA.
[247] ANSTF. Aquatic Nuisance Species Task Force Strategic Plan (2007-2012), 2007.

The adoption of the open ocean exchange in 1990 by the U.S. through NANPCA shows how it is an old measure and, despite the adoption of the BWMC and detailed guidelines, the ballast water management rather effectively evolved to the present. However, the constitution of ANSTF since the early adoption of a specific legislation to address the issue seems to be an appropriate and right alternative to promote integration between all the institutions directly or indirectly involved with invasive aquatic species. It is also important to highlight the fact that its composition and responsibilities are defined by law. Considering the goals listed above, the U.S. Government recognized the limitations of the measures currently adopted and the need to continue discussing in an integrated manner the development and adoption of new tools to manage the problem. Therefore, this can be an alternative model of institutional integration to be followed by Brazil.

3.1.2 National Invasive Species Act (1996)

In 1996, the NANPCA was reauthorized and amended with the National Invasive Species Act (NISA) to expand the Great Lakes' BWM program to all U.S. coastal waters. Initially, the NISA also asked the USCG to establish national voluntary guidelines to prevent the introduction and spread of alien species in all U.S. waters through any operations of vessels equipped with ballast water tanks.[248] The NISA asked the USCG to issue these national guidelines taking into consideration:[249]

- The vessel types;
- The variations in the characteristics of points of origin and destination;
- The variations in the ecological conditions of waters and coastal areas of the United States; and
- The different operating conditions.

The vessels were required to submit to the USCG ballast water records with all the information considered as necessary to assess the rate of effective compliance with the guidelines, as well as to maintain those records on board and make them available for

[248] NANPCA (1990) as amended by the NISA (1996) - Subtitle B - Prevention of Unintentional Introductions of Nonindigenous Aquatic Species. Section 1101 (Aquatic Nuisance Species in Waters of the United States); (c) Voluntary National Guidelines.
[249] Section 1101 (D) of NISA.

occasional inspections.[250] The NISA also prescribed that not later than 3 years after the date of issuance of the national guidelines, and no less frequently than every 3 years thereafter, the USCG shall review these guidelines and assess their compliance by vessels, as well as assess the effectiveness of the guidelines in reducing the introduction and spread of aquatic nuisance species.[251] If the results of the periodic review and assessment demonstrate that the rate of effective compliance with the guidelines is inadequate; or the reporting by vessels pursuant to those guidelines is not adequate to assess the compliance, the USCG shall promptly promulgate regulations that make mandatory the requirements included in the voluntary guidelines.[252]

In order to implement the above, NISA mandate the USCG to develop and maintain a National Ballast Information Clearinghouse (NBIC),[253] in consultation and cooperation with the ANSTF and the Smithsonian Institution.[254] The NBIC was established in 1997 and is responsible for collecting, analyzing, and interpreting data on the BWM practices provided by commercial ships that operate in the U.S. waters. Currently, the NBIC receives roughly 20,000 BWRF per year, which corresponds to approximately 35% of the total number qualifying arrivals.[255]

In June 2002 the USCG issued to the U.S. Congress its report on the vessels compliance with the national voluntary guidelines.[256] During the first two years, from July 1999 to June 2001, the NBIC found that the reporting requirements regarding ballast water exchange were fulfilled by only 30.4% of vessels entering the U.S. EEZ. Consequently, in July 2003 the USCG published a rule for a national mandatory program for BWM in U.S. waters. In August 2004, a final rule promulgated by the USCG describing the penalties for those ships that do not submit ballast water reports came into effect.[257] In 2006, the Environmental Protection

[250] Section 1101 (a); (1) Invasive Species Management Plan; (A), NISA.
[251] Section 1101 (e) Periodic Review and Revision of Regulations; (1); (A) and (B), NISA.
[252] Section 1101 (f); (2) Requirements for Regulations; (A); (ii) of NANPCA.
[253] The National Ballast Information Clearinghouse (NBIC) is a joint program of the Smithsonian Environmental Research Center (SERC) and the United States Coast Guard.
[254] Section 1107 (Ecological, Pathway, and Experimental Research); (j) National Pathways and Ecological Surveys Database; (1) of NISA.
[255] According the NBIC website, available on: http://invasions.si.edu/nbic/; accessed 15 October 2007.
[256] Robin M. Nazzaro, Invasive Species, *op cit*. p. 8.
[257] Department of Homeland Security, Coast Guard, 33 CFR - Part 151 [USCG–2002–13147] RIN 1625–AA51 [Formerly 2115–AG50] Penalties for Non-Submission of Ballast Water Management Reports. AGENCY: Coast Guard, DHS. Federal Register / Vol. 69, nº 113 / Monday, June 14, 2004 / Rules and Regulations p. 32864.

Agency (EPA) was required by the U.S. Federal Court to better regulate ballast water discharge, although it has yet to do so, and thus Federal Regulations for ships' BWM remain the same.[258]

3.1.3 Navigation exclusively in the ZEE

The Shipping Industry Ballast Water Coalition (SIBWC)[259] supported the mandatory BWM program for all ships equipped with ballast tanks that enter in U.S. waters after operating beyond the ZEE.[260] However the SIBWC also recognized that the unique characteristics of the domestic navigation require a different approach for BWM. This type of navigation happens almost exclusively in the ZEE waters and the operational profile of these ships is different from those that operate in great depths, for which the first voluntary BWM program was created. Thus, for the domestic navigation it would be very difficult, perhaps impossible, to fulfill the requirements of the mandatory program.

However, as outlined in the following pages, some States have adopted their own regulations addressing ballast water management and some of these regulations also include requirements for ships sailing exclusively inside EEZ waters.

3.1.4 Onshore treatment facilities

The NISA required the USCG to prepare a study, to be presented to Congress, on the effectiveness and the costs of the use of onshore treatment facilities existing in Alaska to avoid alien species introduction.[261] These facilities were preliminary planed, built and used to treat the oily ballast water from crude oil tankers by extracting the residual oil from the water. The

[258] ICES, Report of the Working Group on Introductions, 2007, *op. cit*. p.114-115.
[259] Members of the Shipping Industry Ballast Water Coalition: American Association of Port Authorities (AAPA), American Maritime Congress, American Petroleum Institute, American Waterways Operators, BIMCO, Chamber of Shipping of America, International Association of Independent Tanker Owners (INTERTANKO), Maritime Institute for Research and Industrial Development, Transportation Institute, and World Shipping Council.
[260] Shipping Industry Ballast Water Coalition (SIBWC) - October 28, 2003 – Letter to Docket Management Facility (USCG-2003-14273) of U.S. Department of Transportation – Regarding the Mandatory Ballast Water Management Program for U.S. Waters (33 CFR Part 151, Federal Register, July 30, 2003, v. 68, n° 146, p. 44691-44696). Available on :
http://www.aapa-ports.org/files/PDFs/Coalition_Comments_NPRM_Mandatory_BWM_Program_Final.pdf/; accessed 15 August 2007.
[261] NANPCA (1990) as amended by the NISA (1996) - Subtitle B - Prevention of Unintentional Introductions of Nonindigenous Aquatic Species. Section 1101. Aquatic Nuisance Species in Waters of the United States - (k) Safety Exemption - (3) Crude Oil Tanker Ballast Facility Study.

Table 6 below shows some cost estimates up to March 2002 for the utilization of onshore ballast water treatment facilities.

Table 6. Cost estimates for the use of ballast water onshore treatment facility.[262]

Description	Costs
Cost estimates driven by additional infrastructure required in ports.	$0.66–$27.00 per cubic meter.
Facility in Valdez, Alaska; covers 1,000 acres of land, processes about 16m gallons of ballast water daily.	$1.4 billion for entire treatment facility.
Estimate based on port-based facility located on land or a floating platform.	$9m–19m for infrastructure; $0.09–$0.41 per metric ton of ballast water treated.

Another study on the evaluation of ballast water treatment technology reported the following costs for onshore treatment facilities in several Californian ports: U$ 7,615,500 to U$49,754,000 for installing the facilities and U$142,400 to U$223,454 to meet their annual operating and maintenance needs.[263] These costs would rise and fall depending on the location of the facility and the amount of ballast water that would be treated. And the port configuration and ballast water discharge volume would determine the cost of ballast water treatment by these onshore facilities, which would range between U$1.40 and U$8.30 per Metric Ton.[264]

The study considered that, despite the associated high costs for establishing and operating onshore treatment facilities, this option may be adequate for smaller ports that receive a fewer number of ships visits. It also would be useful for vessels that need to discharge small volumes of ballast water. Contrary to the Brazilian conclusion about this type of alternative, the study also found that the viability "should increase as future generations of ships and port systems develop."[265] At its end, the study evaluated the onshore treatment facility as an acceptable option considering safety, biological effectiveness, and environmental acceptability.

[262] Source: Federal Register, Cost Estimates for Ballast Water Alternative Technologies from the Recent Literature. Proposed Rules, v. 67, nº 42, p. 9636, 2002.
[263] State Water Resources Control Board - California Environmental Protection Agency, Evaluation of Ballast Water Treatment Technology for Control of Nonindigenous Aquatic Organisms. p. 26, 2002. Available on: http://www.calepa.ca.gov/Publications/Reports/Mandated/2002/BallastWater.pdf/; accessed 19 October 2007.
[264] *Ibid*. p. 28.
[265] *Ibid*. p. 2.

However, the SIBWC considered that the ballast water discharge into land treatment facilities would not be a feasible option due to the absence of this type of structure in the vast majority of the ports, a situation that is not expected to change in the near future.[266]

3.1.5 Alternative method for ballast water treatment

The use of an environmentally safe alternative method for ballast water treatment was not considered as an option for the SIBWC until the USCG promulgated a performance model or standard. If such standard were developed and promulgated together with an experimental on-board test program, the use of an alternative ballast water treatment could be a real option for many ships. With this, the SIBWC also hoped that voluntary actions of research and development for new treatment systems could be adopted by ships operators.

3.1.6 Ballast water exchange

As adopted by the BWMC and by NORMAN-20 of the Brazilian Navy, the principle that states that ships should not deviate from its routes or delay its voyages for the only purpose of executing the procedures of ballast water exchange is also upheld by the U.S. According the SIBWC, in case this rule had not been adopted, the economic impact on the maritime commerce would be significant.[267] Therefore, there seems to be a consensus in the international maritime sector that the potential impacts associated with ballast water would be less significant than the impact the maritime industry would suffer financially for all ships executing oceanic ballast water exchange.

A preliminary analysis was undertaken by the USCG and estimated an annual cost of U$ 2,180.00 per ship for the fulfillment of the requirements of the mandatory BWM rule. The USCG determined that 7,240 vessels would have to comply with the rule, which would represent a total annual cost of approximately U$15.8 million. In 2003, however, the SIBWC revised the previous analysis and came to the conclusion that the annual cost to fulfill the ballast water exchange requirements is actually U$ 7,970.00. This amount is three times more

[266] SIBWC, Letter to Docket Management Facility (USCG-2003-14273) of U.S. Department of Transportation – Regarding the Mandatory Ballast Water Management Program for U.S. Waters (33 CFR Part 151, Federal Register, July 30, 2003, Vol. 68, No. 146, pp. 44691 – 44696), 2003. Available on : http://www.aapa-ports.org/files/PDFs/Coalition_Comments_NPRM_Mandatory_BWM_Program_Final.pdf/; accessed 12 September 2007.
[267] *Ibid.*

than the USCG's value which represents, for the same amount of vessels, a total annual cost of U$57.7 million. The calculation made by SIBWC used a 950 ft container vessel weighing 60,000 tons that holds approximately 12,000 tons of ballast water.

It is estimated that in 2006 the USCG was conducting approximately 7,000 ballast water inspections on vessels for compliance of ballast water management regulations.[268] However, even if most ships showed compliance with the ballast water exchange since 1998, the current requirements of this measure are not recognize by key agencies and stakeholders as a viable long-term approach to minimize the risks posed by ballast water discharges; this primarily because:[269]

- Many ships are exempt from current ballast water exchange requirements;
- The USCG has not established alternate discharge zones that could be used by ships unable to conduct ballast water exchange for various reasons; and
- Ballast water exchange is not always effective at removing or killing potentially invasive species.

One of these stakeholders is the AAPA, which recognizes that oceanic ballast water exchange, although useful for BWM, does not demonstrate to be the ideal method to prevent the introduction of alien species, and expects that on-board treatments would be more efficient and provide more protection to vulnerable aquatic environments.[270]

3.1.6.1 Bi-National Ballast Water Working Group

A great joint initiative undertaken by the U.S. and Canadian agencies to promote the effectiveness of ballast water exchange as a BWM measure to better protect the Great Lakes environment was the establishment of the U.S./Canadian Ballast Water Working Group (BWWG) in 2006.[271] Through the BWWG both States have promoted coordinated regulatory, compliance and research efforts among its agencies for reducing alien species invasions via

[268] ICES, Report of the Working Group on Introductions, 2007, *op. cit*. p.114-115.
[269] Robin M. Nazzaro, Invasive Species, *op cit*. p. 1.
[270] Letter from AAPA (by Kurt J. Nagle, President & CEO) to the Honorable Ted Stevens, Chairman of the Committee on Commerce, Science and Transportation of the U.S. States Senate, June 14, 2005. Available on AAPA website: http://www.aapa-ports.org/; accessed 14 July 2007.
[271] Great Lakes St. Lawrence Seaway System, available on: http://www.greatlakes-seaway.com/en/navigation/ballast_water.html/ accessed 05 October 2007, the BWWG is formed by representatives from Transport Canada Marine Safety, U.S. Coast Guard, the U.S. Saint Lawrence Seaway Development Corporation, and the Canadian St. Lawrence Seaway Management Corporation.

ballast water in the Great Lakes. Therefore, the BWWG caused an increase in the BWM compliance rate due to their joint efforts performing the inspection on every single vessel that declares ballast water on board before allowing it to transit the Seaway/Great Lakes system.

This integrated approach between the USCG regulations and Transport Canada's "Ballast Water Control and Management Regulations" with "Canadian Guidelines for Ballast Water Management" makes the BWM requirements in the Great Lakes St. Lawrence Seaway System in the most stringent in the world.[272] As will be outlined below in Chapter 5 (Brazilian BWM approach), bi-national and even multi-national initiatives would also be necessary considering the inter-connection existing in some continental waterways and the regional and global importance of ecosystems such as the Amazon and Pantanal.

3.1.7 State legislation

Taking into consideration that the federal regulation relating to ballast water would have perceived deficiencies, several States have already decided or are in the process of adopting individual rules to implement a more effective BWM. This includes the following States: Alaska, California, Washington, Illinois, Massachusetts, Maryland, Michigan, New Jersey, New York, Rhode Island, Virginia, Wisconsin, Hawaii, and Oregon.[273]

In general, the State and Federal Regulations are the same for ships arriving from outside the 200 nm EEZ.[274] However, some of the State Regulations (at least in California, Oregon, and Washington) also include mandatory ballast water exchange for those ships moving among States without going outside the ZEE.[275] To discharge ballast water in these States, ships must perform the exchange at least 50 nm from shore prior entering in their ports, or

[272] *Ibid*. The requirement is similar to other U.S. States' and with the BWMC, so all ships destined for Great Lakes ports from beyond the EEZ are required to exchange their ballast in open ocean waters. The fundamental difference is the intensive inspections in all vessels declaring ballast water on board. Ships that have not complied are required to retain the ballast water on board, pump the ballast water ashore, treat the ballast water in an environmentally sound manner or return to sea to conduct a ballast water exchange.

[273] Eugene H. Buck, Ballast Water Management, *op cit*. p. 8; Ship Operations Cooperative Program (SOCP), Appendix A - State Laws And Regulations Relating to Ballast Water. Available on: http://www.socp.org/ballast/papers/State%20Regulations.pdf/; accessed on 15 May 2007; ICES, Report of the Working Group on Introductions, 2007, *op. cit*. p.114-115; The West Coast Ballast Outreach Project, Ballast Management: Laws and Regulations, available on: http://groups.ucanr.org/Ballast_Outreach/Laws_and_Regulations/; accessed 16 November 2007.

[274] ICES, Report of the Working Group on Introductions, 2007, *op. cit*. p.114.

[275] *Ibid*. p. 114-115.

utilize an approved alternative treatment.[276] Moreover, some of these States' regulations also address specific standards and/or types of ballast water treatment systems to be adopted, and time limits for the achievement of specific quality standards related to the concentration of organisms in the ballast water to be discharged, similar to the principle of the BWMC D-2 standard. The AAPA considered that these state initiatives emerged due the existence of a gap in the federal leadership on this important environmental subject.[277] AAPA believe that the federal legislation on ballast water should prevail in any state regulation regarding the issue and should be the supreme legislation regulating ballast water.[278]

3.1.8 A New Ballast Water Management Act

Taking into consideration that the federal programs adopted until the NISA amendment were insufficient to effectively address the ballast water problem, new attempts to amend the NAMPCA have been made through the proposal of a bill for a Ballast Water Management Act (BWMA). According to AAPA, the requirements of the BWMA of 2005 (S. 363) would be very similar to those of the BWMC, with some few but important exceptions.[279] At that time, the AAPA understood that S. 363 should have made clear that any regulation promulgated under the legislation specifically for BWM would be the "sole laws" to govern ballast water discharges into U.S. waters and should also preempt any other state law related to this issue. Thus, the AAPA required an indication by the BWMA that any program developed as part of this federal legislation would represent the supreme law of BWM, which could prevent the possibility of the existence of two different and competing state models of management with possible conflicting measures.[280]

It is important to remember that in 2004 the IMO adopted the BWMC which foresaw the possibility of the States to take more stringent measures than those specified in its text for the control and management of ballast water and sediments of the ships.[281] Therefore, even the U.S. has not ratified the BWMC yet, it seems that the American representatives have been

[276] *Ibid.*
[277] AAPA, Letter to Key House and Senate Leaders Urging Action on Legislation in 109th Congress, 14 June 2005. Available on: http://www.aapa-ports.org/files/PDFs/BallastWater_action_letter_to_Congress.pdf/; accessed 19 August 2007.
[278] *Ibid.*
[279] *Ibid.*
[280] *Ibid.*
[281] *Ibid.*

working in that direction trying to improve their legislation. Although the U.S. had been one of the major proponents of the BWMC[282] and had played an active role in its negotiation,[283] the fact that it did not sign or ratify the BWMC has been criticized even by the SIBWC, which believes that the BWMC should be the foundation of the U.S. national BWM program.[284]

The 2005 S. 363 bill never became law, but recently (09/27/07) a new bill for a BWMA of 2007 (S. 1578)[285] was approved by the Senate Commerce, Science, and Transportation Committee, to "strengthen the existing national ballast water management program for aquatic nuisance species, including uniform, mandatory national standards for ballast water treatment."[286] According to the United States Senate Committee on Commerce, Science, and Transportation,[287] this S. 1578 bill "sets performance standards 100 times stronger than the minimum international standards and includes provisions for strengthening these standards in the future, with a goal of zero discharge." The BWMA of 2007 would also implement the BWMC and specifically adopt a national BWM program for aquatic nuisance species with uniform mandatory national standards for ballast water treatment. However, the states still could have the authority to develop their own programs on condition that the requirements do not conflict with the federal program.

Another bill called Great Lakes Invasive Species Control Act (H.R. 801)[288] has been also referred to the Senate Commerce, Science, and Transportation Committee, this time regarding specifically for the Great Lakes BWM. This bill also amends the NANPCA and is intended to make stricter the requirement on the ballast water exchange. It declares that all vessels equipped with ballast water tanks, including those ones that are not carrying ballast water, have to promote the ballast water exchange or an alternative management methods prior to

[282] Eugene H. Buck, Ballast Water Management, *op cit*. p. 8.
[283] Section 2 - Findings (13) of the Ballast Water Management Act (bill) of 2005.
[284] Testimony of Joseph J. Cox - On behalf of the Shipping Industry Ballast Water Coalition – Regarding "Ballast Water Management: New International Standards and National Invasive Species Act Reauthorization" - Before the Coast Guard and Maritime Transportation and Water Resources and Environment Subcommittees of the House Transportation and Infrastructure Committee - March 25, 2004. Available on: http://www.nemw.org/BW-Coalition-3-25-Testimony.pdf/; accessed 14 July 2007.
[285] This bill is available on: http://www.govtrack.us/data/us/bills.text/110/s/s1578.pdf/ accessed 01 October 2007.
[286] Press Releases webpage of the United States Senate Committee on Commerce, Science, and Transportation, available on: http://commerce.senate.gov/public/index.cfm?FuseAction=Home.Home/ accessed 17 October 2007.
[287] U.S. Senate Committee on Commerce, Science, and Transportation, available on: http://commerce.senate.gov/public/index.cfm?FuseAction=PressReleases.Detail&PressRelease_id=248937&Month=9&Year=2007/; accessed 18 October 2007.
[288] This bill is available on: http://www.govtrack.us/data/us/bills.text/110/h/h801.pdf/ accessed 23 November 2007.

entry into any port within the Great Lakes. Other related bills are the Aquatic Invasive Species Research Act (H.R. 260), Prevention of Aquatic Invasive Species Act of 2007 (H.R. 889), and National Aquatic Invasive Species Act of 2007 (S. 725).

3.2 Concluding Remarks

The large number of biological invasions existing in the U.S. shows that even developed States, with significant availability of financial resources to be applied in programs of prevention, control and the eradication of exotic species are vulnerable to the problem. The great traffic of vessels and consequent high volume of ballast water discharged daily in coastal regions of the U.S. are results of the strong American economy. In fact, this situation demonstrates that when a high economic development does not come with a simultaneous adoption of appropriate measures for environmental protection, the State also suffers serious negative economic, environmental, and social consequences.

Considering this example, it is essential that Brazil with its claims to promote more and more the growth for its economy, which is sustained in part by a continuous increase in its trade relations with other States, adopt measures to ensure real protection of its coastal zone against the impacts of shipping, including those related to ballast water. On the other hand, measures that promote the sanitary development of the coastal cities, especially port cities, are indispensable to make all maritime activities safer, including shipping and its necessary use of ballast water. This way, not only the maritime trade could be used for economic development, but also other sectors such as tourism, fisheries, aquaculture, etc., in order to contribute to the social and environmental development of the Brazilian coastal regions.

The following chapter presents a general overview of the measures adopted by the European States in addressing the historical problem of biological invasions in their marine environments. As will be seen, due to its geographical characteristics, the EU has already adopted regional initiatives, but also depends on an integrated approach between all Member States. Similar with what happens in the American waters, some limitations for the adoption of the open ocean exchange according IMO guidelines will be highlight, as well as the importance of the environmental surveys and monitoring in coastal areas and port areas for the effective management of ballast water.

Chapter 4 Ballast Water Management in Europe

The maritime transportation of loads and goods always played a strategic importance to the development of Europe. Currently, about 90% of foreign trade and more than 40% of the intercontinental European trade is by sea. This corresponds to the transfer of 3.5 billion tons of goods and 350 million passengers annually.[289] The European shipping industry manages the largest merchant fleet in the world, counting 225 million deadweight tons and representing 23% of world tonnage.[290] Around 220,000 vessels of more than 100 tons sail annually on the Mediterranean Sea between its 300 ports,[291] and around 2,000 sizeable ships are normally sailing on the Baltic Sea, one of the busiest shipping routes in the world, at any time.[292]

Analogous to maritime trade, the introduction of invasive species can be analyzed in a historical context in Europe. Some authors suggest that during the Roman Empire the construction of many roads through the continent and the increase in the movement of troops and loads by the seas have considerably raised the chances of new introductions.[293] It is also plausible that the transport of alien species had increased since the fifteenth and sixteenth centuries, a period of great navigations and maritime discoveries by European States, such as Portugal and Spain. Through that time the establishment of new transoceanic and inter-oceanic routes probably started bringing to Europe alien species from the colonies located in practically all parts of the world. Later, during the nineteenth and twentieth centuries, events of war and the construction of channels linking different basins, as the conclusion of the Suez Canal in 1869, also have facilitated the introduction and spread of alien species through Europe and adjacent seas.[294]

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[289] Dr. Joe Borg. A Maritime Policy for the Union: An Opportunity for the Mediterranean. Intervention on the occasion of the 5th Med Trade Summit, Malta, 17 May 2007. Maritime Affairs of the European Commission website: http://ec.europa.eu/transport/maritime/careers/index_en.htm/ accessed 20 October 2007.

[290] *Ibid*. The European merchant fleet would comprise 8,690 vessels under European States' flags in addition to the control of some 3,500 ships under foreign flags.

[291] Maria Monia Flagella and Ameer A.Abdulla. Ship Ballast Water, *op cit*.

[292] Source of the information available on: http://www.helcom.fi/shipping/en_GB/main/ accessed 18 October 2007.

[293] Riccardo Scalera and Daniela Zaghi. European Commission. LIFE Focus: Alien species and nature conservation in the EU. The role of the LIFE program. Luxembourg: Office for Official Publications of the European Communities, 56 pp. 2004.

[294] Vadim Panov *et al*, International Cooperation in Aquatic Invasive Species Research, Information Exchange and Management in Europe. Aquatic Invaders – The Digest of National Aquatic Nuisance Species Clearinghouse,

During the last decades, local and regional studies and surveys have also indicated that the rate of invasions in continental and coastal environments by aquatic alien species grew significantly in Europe.[295] In general, these studies showed that every European State has been seriously affected by alien species. According to the United Kingdom's Maritime and Coastguard Agency (MCA), more than 400 alien species have been found only in northwest Europe, including the Baltic and Celtic Seas. Of those, 261 species would be in marine environments, 85 in continental waters and 28 in brackish waters; and 105 of the total were introduced via ballast water.[296]

In 2005, the MCA prepared a study to provide subsidies for the development of a regional strategy for ballast water and sediments management in the North Sea and north-west Europe.[297] The final report of this study indicates that there are currently no specific formal laws addressing the management of ballast water in European States. Also, no reporting requirements on ballast water management have been introduced for ships calling on ports in the North-East Atlantic and land based reception facilities are not available in any European port.[298] Just Norway, through its Directorate for Nature Management, had elaborated a report on ballast water management, considering even appropriate areas for ballast water exchange. The idea is using this report as a basis for a new legislation on the issue in that State.[299]

In the same way, according with the same report, just a few European States have so far have undertaken detailed estimates of ballast water volumes dumped in their ports. The following Table 7 presents the information provided by the report, which is outdated and certainly underestimates the current discharges of ballast water.

New York Sea Grant, v. 13, nº 4, p. 1, 2002. Available on: http://www.aquaticinvaders.org/; accessed 15 October 2007.

[295] *Ibid.*

[296] MCA, Ballast Water Scoping Study North Western Europe. 4 – The Ballast Water Situation in NW Europe. Available on: http://www.mcga.gov.uk/; accessed 18 October 2007.

[297] Det Norske Veritas, Ballast Water Scoping Study: North Western Europe. Report nº 2005-0638. Revision nº 02, 2005.

[298] According MCA website on the ballast water situation in NW Europe, available on: http://www.mcga.gov.uk/; accessed 22 October 2007.

[299] ICES, Report of the Working Group on Introductions, 2007, *op. cit.* p.85.

Table 7. Estimates of ballast water discharges in some European States[300]

Country	Information
Germany	Data from 1992 to 1996. Estimate of 19.6 million tons of ballast water discharged into German port areas annually, plus 1.5 million tons of ballast water dumped into German waters during the approaches of vessels to ports. Thus, the total volume would be more than 21 million tons annually.
France	Estimate made considering the ballast water volume as 40% of the cargo weight loaded and unloaded. Thus, France would have exported about 70 million tons and imported 22 million tons of ballast water. Of this imported volume, the majority would have been discharged into the Atlantic ports of le Havre and Roven (6 million tons each); Dunkerque (3 million tons), Nantes (2.5 million tons), la Rochelle (1.2 million tons) and Bordeaux (1 million tons). The French Mediterranean ports would receive together a total of 1 million tons of ballast water, mainly into the port of Marseille. The report does not specify the reporting period nor if it corresponds to an annual estimate.
Lithuania	A study carried out in 1999 had estimated an annual discharge of ballast water to be between 2 and 4 million tons into the Port of Klaipeda, the major port in Lithuania.
Nederlands	In 1998, the Dutch ports exported 68 million tons of ballast water, which corresponds to 86% of the total exported ballast water from European ports. On the other hand, the imported volume for the same year would be 7.5 million tons, or 42% of the total imported by European ports. The main ports would be Amsterdam and Rotterdam.
Norway	The ports that more receive ballast water in Norway would be the oil terminal of Mongstad (20 million tons in 2000), the terminal of LNG / LPG in Karsto (6 million tons), and the LNG terminal in Melkoya (4 million tons in 2006). Others ports whose also receive significant volumes of ballast water would be the oil terminal of Sture and the ore exporter terminal of Narvik, but the report does not indicate the corresponded volumes.
Sweden	Using data from July to September 1997 it was estimated that an annual volume of 23.2 million tons of ballast water was discharged into Swedish waters. Another recent estimation[301] made by information obtained from forms answered by shipowners and 81 different types of vessels, and also by statistical data of the Swedish Maritime Administration for the year of 2005, have indicated a total volume of 46 million tons of ballast water was being discharged annually in Sweden and 44 million tons was being exported from Swedish ports.

Regarding the BWMC, so far just Spain and Norway have deposited the instrument of permanent ratification, while Finland and the Netherlands have only signed the document during the initial period (1 June 2004 until 31 May 2005) in which it was opened for signature. Considering that the European shipping industry controls almost a quarter of the WMF, the ratification of the Convention by just two of the European Community States is disappointing. Due to their importance in the world maritime business, the ratification of the BWMC by

[300] Det Norske Veritas, Ballast Water Scoping Study, *op cit*. p. A-1 to B-4.

[301] Karin Hoffrén, Pilot Study on Annual Ballast Water Discharge and Uptake in Sweden. Swedish Maritime Safety Inspectorate, April 2006. For the Helsinki Commission. Maritime Group, Sixth Meeting. Agenda Item 7, Ballast water. Szczecin, Poland, Document code: 7/1/INF, 9-11 October 2007. Available on: http://sea.helcom.fi:15037/dps/docs/documents/Maritime%20Group/HELCOM%20MARITIME%206,%202007/7_1_INF%20Ballast%20water.pdf/; accessed 05 November 2007.

European nations such as Greece, Germany, Italy, Denmark, and the United Kingdom, as well as by the FOC countries, is crucial to make it come into force.

Nevertheless, taking into consideration that the protection of European marine ecosystems would be impossible to be tackled individually by any State, the European Community has been working to promote integrated actions for a regional approach.[302] This follows the regional strategies of the European Commission for the marine environment, which says that member States must, among other things, promote the analysis of the main impacts of human activities that affect the natural characteristics of European waters, including the aspects related to the introduction of alien species.[303] The conservation and recovery of the main European marine regions (OSPAR, the Mediterranean Sea and Baltic Sea), including measures of prevention and management of marine introductions, are also subject to some regional maritime treaties.[304] Below are enumerated certain initiatives undertaken for the management of ballast water in those regions.

4.1 OSPAR Region

Regarding the OSPAR maritime area,[305] measures to prevent and eliminate pollution and to promote the protection of its marine environment against the adverse effects of human

[302] Various regional events, projects and working groups have been created, amongst them: (1994) the Baltic Marine Biologists (BMB) Working Group on Non-indigenous Estuarine and Marine Organisms (WG NEMO); (1997-1998) the Nordic Risk Assessment Project, developed and implemented in five representative port areas of the northern region of Europe, each one in a different country (Norway, Sweden, Lithuania, Finland and Russia); (2001) the UNDP Caspian Environment Program (CEP) Regional Invasive Species Advisory Group (RISAG); (1998-2000) the EU Concerted Action Project, with the specific title of "Testing Monitoring Systems for Risk Assessment of Harmful Introductions by Ships to European Waters", involving the IMO and seven States (Finland, Germany, Ireland, Sweden, England, Scotland, and Lithuania); and (2001-2004) the EU MARTOB Project entitled "On-board treatment of ballast water and application of low sulphur fuels" which involved eight States of the European Community (Denmark, Finland, France, Greece, The Netherlands, Norway, Sweden, and UK). In: Vadim Panov, Stephan Gollasch, Erkki Leppäkoski, and Sergej Olenin. International Cooperation in Aquatic Invasive Species Research, Information Exchange and Management in Europe. Aquatic Invaders: The Digest of National Aquatic Nuisance Species Clearinghouse. Volume 13, Number 4, 5 p. New York, Sea Grant, 2002 (in http://www.aquaticinvaders.org).

[303] Available on: http://europa.eu/scadplus/leg/en/lvb/128164.htm/; accessed 07 November 2007. Considering the size of Brazil, this strategy could be adopted among States, which could then organize regionally to provide subsidies for a plan or national program.

[304] ICES Advisory Committee on the Marine Environment. ICES WGBOSV Report 2006, *op cit.*; Riccardo Scalera and Daniela Zaghi. European Commission. LIFE Focus: Alien species, *op cit.*

[305] Defined by Article 1 (a) of the OSPAR Convention (1992), which would be divided in 5 main regions: Arctic Waters (5.5×10^6 km^2), Greater North Sea (7.6×10^5 km^2), Celtic Seas (3.6×10^5 km^2), Bay of Biscay and Iberian Coast (5.3×10^5 km^2), and Wider Atlantic (6.3×10^6 km^2). In: OSPAR Commission 2007. Atmospheric Nitrogen in

activities were related in the scope of the OSPAR Convention (Paris Convention 1997).[306] Thus, considering its objectives, ballast water management could be possibly considered under this Convention since ballast water is part of a human activity, has potential adverse effects and can also be a source of marine pollution.

Considering the North Sea, the threats and issues related to invasive alien species have been raised during the Fifth International Conference on the Protection of the North Sea, a Ministerial conference held in Bergen (Norway) in March 2002. The conference resulted in the Bergen Declaration, a series of commitments for the adoption of measures to protect or improve the North Sea environment. This declaration presented a section on water ballast, where participants agreed, among other things, to support the development of the BWMC, and to work for its prompt entry into force.[307] In February 2003, during the first North Sea Committee of Senior Officials (CONSSO) Issue Group on Sustainable Shipping (IGSS) held in Stockholm, the United Kingdom volunteered to prepare a basic document for a "Ballast Water Strategy Paper for the North Sea". However, the IGSS showed their preference for a larger scale than the North Sea for this strategy, which would be decided after consideration by the EU, OSPAR, and HELCOM.[308] Hence, in June 2007 the United Kingdom submitted to the OSPAR Commission[309] a proposal of voluntary guidelines for ballast water management for ships going to the OSPAR region.[310] The adoption of such guidelines would be a direct

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the OSPAR Convention Area in 1990-2004. Eutrophication Series, Publication Number n^{o} 344/2007, p.11-12, 2007.

[306] Available on: http://europa.eu/scadplus/leg/en/lvb/128061.htm/ accessed 19 October 2007.

[307] While the BWMC was not completed, the intention should be follow to the guidelines of Resolution A.868 (20) and other relevant international law to reduce the problem in the North Sea. The adoption of measures such as monitoring programs, information exchange, early warning systems, combating actions, control and enforcement was also considered. In: Helsinki Commission. Ballast Water Management in the North Sea. Helcom Maritime 2/2004, Maritime Group, Second Meeting, Stockholm, Sweden, 20-22 January 2004, Agenda Item 5, Matters related to discharges from ships. Document code: 5/3, p. 3, 2004.

[308] Helsinki Commission, Ballast Water Management in the North Sea. Helcom Maritime 2/2004, Maritime Group, Second Meeting, Stockholm, Sweden, 20-22 January 2004, Agenda Item 5, Matters related to discharges from ships. Document code: 5/3, p. 1-2, 2004.

[309] The OSPAR Commission website: http://www.ospar.org/.

[310] According to its provided action plan, ballast water exchange guidelines would start to be applied in September 2007, and in September 2008 would be expected to provide guidance on appropriate measures to reduce the risks associated with short sea shipping between different bioregions.

implementation of the key elements of the BWMC, and should be followed until it comes into force and the ships start to comply with the D-2 standard treatment.[311]

4.2 Mediterranean Sea

Since 1976 the Mediterranean Sea counts on the determination of the Barcelona Convention System (amended in 1995) to promote the protection and recovery of the marine environment and to reduce and eliminate marine pollution, including that originating from vessel operations. To achieve these goals, the Member States of this Convention should individually or jointly adopt measures that contribute to the sustainable development of the Mediterranean Sea.[312]

Regarding more specifically ballast water management, one of the first efforts was made by the Italian NGO called Marine Biology Society, which supported by the Italian Ministry of Environment gathered experts to work on a project for the Central Institute of Marine Research (ICRAM).[313] This project would produce knowledge about the status of alien species in the Mediterranean, training specialists, undertake pilot surveys and ballast water studies in ports. Considering the necessity of harmony between its actions with international efforts, contacts were established with the appropriate working groups of the ICES, the International Commission for the Exploration of the Mediterranean Sea (CIESM)[314] and the European Marine Biology Symposium (EMBS).

In November 2002 the CIESM hosted a workshop to promote a multidisciplinary review of the existing knowledge on the scale and impact of alien species carried by ships in the Mediterranean Sea and Black Sea.[315] This workshop encouraged the implementation of a port survey program for the entire Mediterranean addressed to introductions of organisms caused by ships. This program made use of the Australian Centre for Research on Introduced Marine

[311] Agenda Item 6 of the Meeting of the OSPAR Commission. Presented by the United Kingdom. The Development of a Regional Management Strategy for Ballast Water Management in North West Europe – An Update on Phase 2 of the Project. p. 2, June 2007.
[312] Available on: http://europa.eu/scadplus/leg/en/lvb/128084.htm/; accessed 21 October 2007.
[313] Invasive Species Specialist Group of the IUCN Species Survival Commission. ALIENS. Number 19 & 20 2004.
[314] CIESM website: http://www.ciesm.org/.
[315] Port surveys of alien organisms introduced by ships. In: CIESM Portal Baseline Survey, available on: http://www.ciesm.org/marine/programs/portal.htm/; accessed 20 October 2007.

Pests (CRIMP)[316] standardized protocols for baseline port surveys, which makes possible the identification of alien species with potential to cause risks to human health. This is the same methodology that later was adopted for the first phase of the GloBallast Programme.[317]

4.3 Baltic Sea

Although there has been a lack of specific legislation for ballast water management in the Baltic Sea region, measures addressed to environmental protection and marine pollution prevention have been provided since 1974 by the Convention on the Protection of the Marine Environment of the Baltic Sea Area (Helsinki Convention). Like the Paris Convention and the Barcelona Convention, the Helsinki Convention aims to reduce pollution caused by, among other sources, ship operations; especially with regard to oil spills, other harmful substances, and effluents discharges (sewage and waste water).[318]

Regarding ballast water specifically, the workshop "Ballast water introductions of alien species into the Baltic Sea" was held in February 2005 and was attended by representatives from all Baltic Sea States, as well as Ukraine, Norway and WGBOSV. During the workshop, due to the physiographic characteristics of the Baltic Sea (average depth of 55 meters and areas deeper than 200 meters located less than 50 nm from the nearest land), the performance of ballast water exchange according the criteria established by the BWMC was considered unfeasible.[319] In cases like this, States need to designate specific areas where ships could do the ballast water exchange in accordance with Paragraph 2 of Regulation B-4. Thus, it was verified that the ballast water exchange could not be the sole measure for the effective management of ballast water in the Baltic Sea, and that the development of risk assessment methodologies for ports and areas of special interest is indispensable. It was also related the need for adopting other tools, such as biological surveys, monitoring programs, early-warning systems, and appropriate treatment for ballast water.

[316] Hewitt Ch. L. and R.B. Martin, Port surveys for introduced marine species – background considerations and sampling protocols. CRIMP Technical Report n^{o} 4. CSIRO Division of Fisheries, Hobart. 40 pp. 1996; Hewitt Ch. L. and R.B. Martin, Revised protocols for baseline port surveys for introduced marine species: survey design, sampling protocols and specimen handling. CRIMP Technical Report n^{o} 22. CSIRO Division of Fisheries, Hobart. 46 pp. 2001.
[317] GloBallast Programme, Ballast Water News. Issue 4. p. 3, March 2001.
[318] Available on: http://europa.eu/scadplus/leg/en/lvb/128089.htm/ accessed 23 October 2007.
[319] Report of the BSRP/HELCOM/COLAR. Workshop on Ballast water introductions of alien species into the Baltic Sea. Palanga, Lithuania. 12 p. February 2005.

The limitations of ballast water exchange as a measure of ballast water management in the Baltic Sea were also considered by the Baltic Marine Environment Protection Commission (Helsinki Commission - HELCOM).[320] According to the HELCOM, the ballast water exchange for ships originated from outside the Baltic Sea, and in some cases for inner-Baltic shipping, could increase the discharges of ballast water in the North Sea. As a consequence, it would be difficult to designate those previously mentioned specific areas for ballast water exchange due to the risk of causing introductions in neighboring seas and adjacent jurisdictions; a point which reinforces the need for developing an integrated strategy for the whole continent.[321]

4.4 Integrated approach

Some initiatives were also developed from a continental scale. In the early 70's, the Working Group on Introductions and Transfer of Marine Organisms (WGITMO) was established by ICES to consider the intentional introductions (such those caused by aquaculture); and in 1998 the International Association of Theoretical and Applied Limnology (SIL) established the Working Group on Aquatic Invasive Species (WGAIS) with the goal of creating an expert forum for the development of new strategies to combat further introductions.[322] Another working group specifically addressing invasions resulting from the transportation and disposal of ships' ballast water: the "Working Group on Ballast and Other Ship Vectors" (WGBOSV), established in 1996 through a jointly initiative of the International Council for the Exploration of the Sea (ICES), the Intergovernmental Oceanographic Commission (IOC), and IMO.[323]

Considering the mentioned need for the establishment of a continental plan throughout Europe, a project led by the European Topic Center on Nature Protection and Biodiversity of the European Environment Agency,[324] intends to promote the integration of diverse information raised by studies produced by isolated initiatives of scientific institutes and public administrations. The intention would be to determine how integrated the status of invasive

[320] HELCOM website: http://www.helcom.fi/.
[321] ICES Advisory Committee on the Marine Environment. ICES WGBOSV Report 2006, *op cit*. p. 11.
[322] Vadim Panov *et al*, International Cooperation in Aquatic Invasive Species, *op cit*. p. 2.
[323] Available on: http://www.ices.dk/iceswork/wgdetailacme.asp?wg=WGBOSV/; accessed 23 October 2007.
[324] European Environment Agency website: http://www.eea.int/.

alien species in the EU, including the listing of its environmental impacts and socio-economic.[325]

4.5 Concluding Remarks

All risk reducing measures, including ballast water exchange, are considered as essential tools to protect European seas from new species introductions.[326] However, the limitations for using ballast water exchange in some of the European waters is one more reason against its adoption as the exclusive measure for ballast water management, since hindrances to its accomplish under criteria of the BWMC could be very frequent or even permanent for some regions in the world.

On the other hand, biological surveys studies in ports, monitoring programs and ports environmental characterization are considered essential measures in virtually all European initiatives for ballast water management. This is exactly the necessary complementary approach to be developed and implemented in Brazil. However, this must be done under well defined national standards and combined with more integration between all Governmental and private institutions involved. Moreover, it is also necessary to define which of these actors should be responsible for the financing and/or the implementation of such studies, and also the gathering and consolidating of the information generated. Finally, it is crucial that this approach would be carried out under a legal base, taking into consideration the causes, consequences and solutions for all inconveniences and problems related to ballast water discharges.

Therefore, the currently insufficient legal mechanism for BWM in Brazil could be complemented in order to promote more efficient control and prevention of the ballast water impacts. Consequently, and more importantly, through this new approach more effective environmental protection could be achieved to guarantee the constitutional rights of the Brazilian people related to the public use and access of a balanced environment while the expected on-board ballast water treatment technology is still under development.

The next chapter provides a general overview of the Brazilian approach to BWM. The objectives include characterize the Brazilian port system facing the ballast water problem and

[325] Riccardo Scalera and Daniela Zaghi. European Commission. LIFE Focus: Alien species, *op cit*.
[326] ICES Advisory Committee on the Marine Environment. ICES WGBOSV Report 2006, *op cit*. p. 12.

the environment where the ports are inserted, identify all institutions involved with the issue, discuss the efficiency and effectiveness of the Brazilian BWM, and outline alternatives for its improvement.

Chapter 5 Brazilian Response (National implementation)

Currently, the only measure for managing discharges of ballast water in Brazil is open ocean exchange. However, in addition to the limited efficiency that the method shows even when properly applied and the several technical justifications for it not be performed during navigation, it is possible that the open ocean exchange has not been intentionally applied by many vessels calling on Brazilian ports. One of the reasons could be the lack of sufficient resources to allow the competent institutions to conduct adequate surveillance of vessels to effectively ensure the implementation of the measure and penalize those that do not perform it. Another deficiency that prevents the establishment of an effective national program for ballast water management in Brazil is the lack of standardized environmental surveys in the Brazilian port areas and integration of the data obtained by all institutions directly and indirectly involved with the matter. Many of the environmental monitoring programs currently adopted by ports administrations do not follow the same methodologies, do not include representative samples of port areas, and do not examine the presence of alien species.

This Chapter is divided into 7 sections. It starts with a short characterization of the Brazilian coastal zone, which encompasses a wide range of different and important environments and where the great majority of ports are located. In the sequence, the Brazilian port system is described, including an overview analysis of its evolution within the movement of cargo and the identification of the ports that in theory would been importing great volumes of ballast water. A description and comments on the role of the Governmental institutions that directly or indirectly lead all environmental and economic aspects of port and shipping activities in Brazil will follow. The legal mechanisms currently available in the State for managing ballast water discharges is the subject of the next section, which also discuss their enforcement and efficacy for preventing all threats posed by alien species and pathogenic agents introductions. Finally, this chapter concludes by presenting and discussing how the environmental licensing process of ports could be used for improving the Brazilian approach to ballast water management without undermining the provisions of the BWMC.

5.1 The Brazilian Coastal Zone

The Brazilian coastal zone covers a geographic area of approximately 388.000 km² along a 8.698 km long coast.[327] According the legal definition, the coastal zone includes the geographic space of air, sea and land interaction, including its renewable and non-renewable resources, and encloses maritime and terrestrial zones.[328] The maritime zone covers the totality of the Brazilian territorial sea, which entails the belt of sea twelve nm in width, measured from the straight baselines;[329] while the terrestrial zone corresponds to the space covered by the limits of the cities under direct influence of the coastal natural phenomena.[330] This space encompasses a great diversity of environments and landscapes such as mangroves, dunes, cliffs, bays, estuaries, coral reefs, beaches, rocky shores, islands, heaths, and lagoons.

[327] This extension considers all geographical cuts and entrances of the coast line, as bays, coves, etc.

[328] Established by Article 2, Brazilian Federal Law nº 7661/1988, which institutes the National Plan of Coastal Management – PNGC, and regulated by Article 3, Brazilian Federal Decree nº 5300/2004, which regulates Law nº 7661/1988 and defines the rules for the use and occupation of the coastal zone and establishes criteria for maritime coast management, and other provisions. There is no rigorous international system or agreement for the definition of the State's coastal zones. Regarding Chapter 17 of Agenda 21, the only reference to a "coastal zone space" is that more than half the world population lives within 60 km of the shoreline, and this could rise to three quarters by the year 2020 (paragraph 17.3).

[329] Established through the Brazilian Federal Decree nº 4983/2004 and deposited by Brazil with the Secretary General of the United Nations, under UNCLOS, on 11 May 2004.

[330] According to item 2.8 of the National Plan of Coastal Management II (PNGC II), established by the CIRM Resolution nº 005 of 3 December 1997, considering the effects that socio-economic and cultural activities have on the conformation of the coastal territory, the terrestrial zone covers the areas marked by the same activities of coastal characteristics and the areas under their direct influence. Item 2.9 considers municipal boundaries due to their importance to preserve the necessary joints in the coastal management process as, according to item 2.7, the non-fragmentation of on land natural units within the coastal ecosystems allows the utilization of their resources respecting their integrity. Item 3.1.2 of the same Resolution better defines the cities under influence of coastal phenomena as:

- The municipalities in front of the sea, whose classified list is established by the Brazilian Institute of Geography and Statistics (IBGE);
- The municipalities not in front of the sea but located in coastal metropolitan regions;
- The municipalities contiguous to major coastal cities and state capitals, whose present process of conurbation;
- The municipalities up to 50 kilometers from the coast line, which hold in their territory activities or infrastructure of major environmental impact on the coastal zone or coastal ecosystems of high importance;
- The estuarine/lagoon municipalities, even if not directly in front of the sea, due to the importance of these environments for the marine-coastal dynamic; and
- The municipalities that, even if not in front of the sea, have all their boundaries established with municipalities similar to those mentioned above.

Considering the similarity among the natural characteristics of all these environments, and the continental dimension of the State, the Brazilian coastal zone covers at least three large marine ecosystems (LME):[331]

- The South Brazil Shelf, 567,996 km² which is bordered by the states of Rio de Janeiro, São Paulo, Paraná, Santa Catarina, and Rio Grande do Sul. This LME cover a wide continental shelf that reaches 220 kilometers in some areas, which sustains moderately diverse food webs and higher production than the East Brazil LME to the north, and has shipping as an important economic activity together with artisanal and commercial fishing and tourism. Regarding to pollution, the Global International Waters Assessment (GIWA) classifies this LME as severely impacted in terms of eutrophication with severe economic consequences. The main sources of marine pollution in this LME are linked to land-based activities, especially arising out of urbanization and coastal development, tourism and recreation centers, transport and oil refineries;[332]

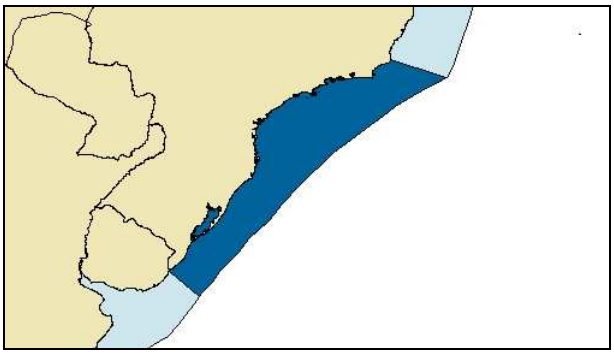

Figure 9. The South Brazil Shelf Large Marine Ecosystem[333]

- The East Brazil Shelf, 1,079,113 km² which is bordered by the states of Piauí, Ceará, Rio Grande do Norte, Paraiba, Pernambuco, Alagoas, Sergipe, Bahia, and Espirito Santo. Despite the Abrolhos Bank, this LME has a narrow continental shelf with an oligotrophic system that results in a diverse food web and low production. The GIWA characterizes this LME as severely impacted in terms of eutrophication,

[331] UN Atlas of the Oceans, *op cit*., large marine ecosystems (LMEs) are:

> regions of ocean and coastal space that encompass river basins and estuaries and extend out to the seaward boundary of continental shelves and the seaward margins of coastal current systems. As their name states, LMEs are relatively large regions that have been delineated according to continuities in their physical and biological characteristics, including inter alia: bathymetry, hydrography, productivity and trophically dependent populations. The LME as an organizational unit facilitates management and governance strategies that recognize the ecosystem's numerous biological and physical elements and the complex dynamics that exist amongst and between them.

[332] Source: http://na.nefsc.noaa.gov/lme/text/lme15.htm/ and http://www.seaaroundus.org/lme/SummaryInfo.aspx?LME=15/ accessed 05 January 2008.

[333] Sea Around Us. A global database on marine fisheries and ecosystems. Fisheries Centre, University British Columbia, Vancouver (British Columbia, Canada), 2008. Available on: http://www.seaaroundus.org/ accessed 06 January 2008.

microbiological pollution, chemical pollution and solid wastes, with severe economic consequences. The main sources of marine pollution in this LME are linked to land-based activities, especially those arising out of unplanned coastal development, tourism and recreation centers, and ocean transport;[334] and

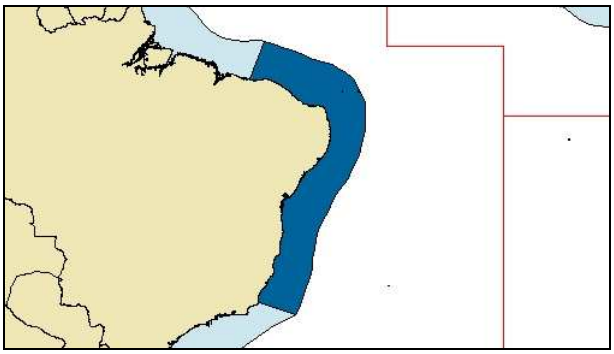

Figure 10. The East Brazil Shelf Large Marine Ecosystem[335]

- The North Brazil Shelf, 1,058,516 km² which is bordered by the Brazilian states of Maranhão, Pará and Amapá, in addition to French Guiana, Suriname and Guyana. This LME cover a wide continental shelf, featuring macrotides and upwellings along its edge, and presenting moderately diverse food webs and high production due to the high input of nutrients associate to the Amazon River and its extensive plume. Considering the sustainable exploitation of fisheries and the predicted direction of future changes, the GIWA characterizes this LME as severely impacted in terms of loss of ecotones, and socioeconomic and community impacts. The Amazon's biodiversity and habitats are under many threats, some of them results of pressures associated with urban and industrial development that have been increasing boat traffic on the Amazon and coastal pollution.[336]

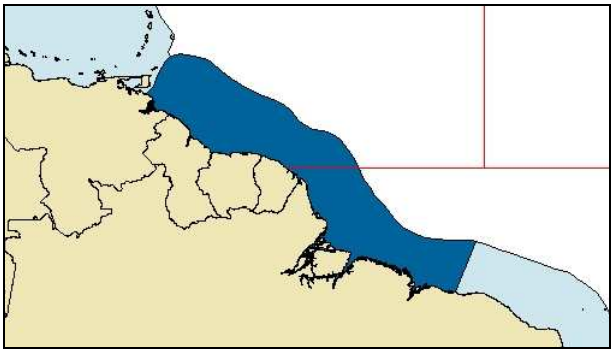

Figure 11. The North Brazil Shelf Large Marine Ecosystem[337]

[334] Source: http://na.nefsc.noaa.gov/lme/text/lme16.htm/ and http://www.seaaroundus.org/lme/SummaryInfo.aspx?LME=16/ accessed 05 January 2008.
[335] Sea Around Us. A global database, *op cit*.
[336] Source: http://na.nefsc.noaa.gov/lme/text/lme17.htm/ and http://www.seaaroundus.org/lme/SummaryInfo.aspx?LME=17/ accessed 05 January 2008.
[337] Sea Around Us. A global database, *op cit*.

As can be seen through the descriptions of these LMEs, a great part of the Brazilian coastal zone – as with other coastal zones of the world – still suffers due the absence of the effective application of sustainable and integrated measures for coastal management. Instead, it is a target of tough historical disputes for the control and exploration of its common spaces and resources. The increasing pressure on its marine and continental resources, allied to the limited capacity of ecosystems to absorb the resultant impacts of this process, leads to significant environmental degradation. The biggest environmental impacts observed in the Brazilian coastal zone include the introduction of nutrients into the aquatic environments, the alteration and/or destruction of habitats, changes in intensity of erosion, transport and sedimentation of coastal deposits, over exploration of the fishing resources, industrial pollution (mainly by persistent pollutants) and the introduction of alien species,[338] which when is caused by ballast water discharges mostly happens in port areas.

Other more detailed divisions of the Brazilian coastal zone were made considering its environmental characteristics, including the one used for the ballast water risk assessment of the port of Sepetiba (Itaguaí) during the GloBallast Programme, which was based on the IUCN scheme of the world's marine bioregions.[339] Recently, a new global system for coastal and shelf areas called Marine Ecoregions of the World (MEOW) was prepared considering the need for a more detailed and comprehensive biogeographic system to classify the oceans.[340] This MEOW system was developed considering earlier global systems including LMEs. It covers all coastal and shelf waters shallower than 200 meters, classifying them in 12 realms, 62 provinces, and 232 ecoregions. According to the MEOW system, the Brazilian coastal zone would be divided into the categories depicted in Table 8 and Figure 12 bellow.

[338] IBAMA, GEO Brasil 2002: Perspectivas do Meio Ambiente no Brasil. - O estado das atividades nos ambientes marinhos e costeiros – p. 118-131. Brasília, 2002. (emphasis added)
[339] Chris Clarke *et al*, GloBallast Monograph Series nº 14. Ballast Water Risk Assessment, Port of Sepetiba, Federal Republic of Brazil, p. 18-20, Final Report, December 2003.
[340] Mark D. Spalding *et al*, Marine Ecoregions of the World: A Bioregionalization of Coastal and Shelf Areas. BioScience, v. 57, nº 7, p. 573-583, 2007.

Table 8. Reams, provinces and ecoregions of Brazil according MEOW system

Realm	Provinces	Ecoregions
Tropical Atlantic	(13) North Brazil Shelf	(72) Amazonia
	(14) Tropical Southwestern Atlantic	(73) Sao Pedro and Sao Paulo Islands
		(74) Fernando de Naronha and Atoll das Rocas
		(75) Northeastern Brazil
		(76) Eastern Brazil
		(77) Trindade and Martin Vaz Islands
Tropical Atlantic Temperate South America	(47) Warm Temperate Southwestern Atlantic	(180) Southeastern Brazil
		(181) Rio Grande
Obs.: The numbers between parentheses follow the MEOWs numbering.		

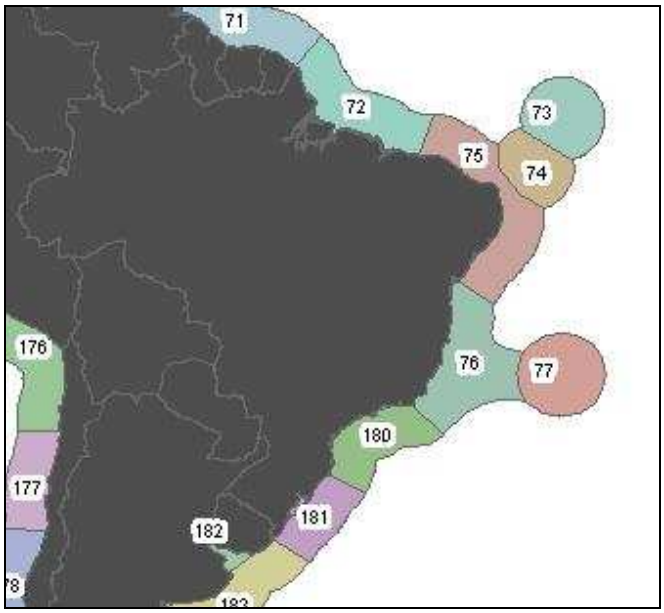

Figure 12. The MEOW Marine Ecoregions of Brazil[341]

Considering the objectives and geographic definition of the MEOW system, it may be useful for assessing the risks of ballast water discharges, as well as for strategically planning new marine conservation measures regarding ballast water management and alien species introductions and assessing their progress. However, considering the huge potential for Brazil

[341] Available on the WWF website: http://www.worldwildlife.org/MEOW/ecoregions.cfm#/; accessed 5 January 2007.

to increase the use of its continental waterways, the effectiveness of these goals would depend on a combined approach between a system like MEOW and a hydro-geographical division of Brazil like the one used by the CONAMA's exotic species working group to define new management requirements (Figure 13).

Figure 13. Hydrographic regions of Brazil[342]

The importance of considering continental waterways for BWM in Brazil, in addition to the coastal zones, is outlined by the fact that as in the United States, the fresh water golden mussel (*Limnoperna fortunei* Dunker, 1857) is the invasive species that most stands out in Brazilian waters and was introduced in South America via ballast water. Although it has not been studied as extensively as the zebra mussel in North America, it is well know that the golden mussel has caused similar negative environmental, economic and social impacts. Figure 14 below shows the distribution of the gold mussel in 2004.

[342] Source of the picture: archive of the CONAMA's exotic species working group. According Annex 1 of the Resolution n° 32/2003 of the National Council of Hydrological Resources (CNRH).

Figure 14. Golden Mussel Distribution in 2004[343]

5.2 The Brazilian Port System

Currently, the Brazilian public port system is composed of dock companies, state and city concessions, and private terminals. As previously mentioned, there are 44 important ports and more than 140 terminals serving as potentially gateways for marine bioinvasion in Brazil. Figure 15 below shows the location of the most important Brazilian ports. Brazil adopted the "Landlord Port model" where port authorities retain the port infra-structure and regulatory functions, whereas the port services are provided by private operators.

Due its geographical location and/or its close articulation with the coastal metropolitans regions, and considering its strategic and economic importance, the ports should have an important role in the process of integrated coastal management. However, even though considered by the legislation as an activity with high polluting potential,[344] most of the Brazilian ports do not undertake environmental management of their operations nor do they have a plan for the assessment and remediation of environmental liabilities.

[343] Márcia Divina de Oliveira *et al*, Área de Ocorrência do Mexilhão Dourado (*Limnoperna fortunei*) na Bacia do Alto Paraguai, entre os anos de 1998 e 2004. Embrapa Pantanal, 19 p. 2004. Available on: http://www.cpap.embrapa.br/; accessed 23 May 2007.

[344] Annex VIII, Brazilian Federal Law nº 10165/2000, which defines the potential of pollution and the level of natural resource use for all activities subjected to inspections.

Figure 15. Map with the location of the most important ports in Brazil.[345]

Some of the reasons for this reality are external and include amongst others the lack of more effective inspections by the environmental agencies and the absence of direct application of Governmental resources for the environmental regularization of Brazilian ports. However, the main reason is the persistence of the adoption of a mistaken administrative vision by the port authorities in dealing with the environmental matters. Most port authorities still consider the environmental requirements or the adoption of environmental control systems as merely an unnecessary onus or as a bottleneck to the development of the port activity. Moreover, many times it is believed by the head of some port authorities that the ports environmental control should be the exclusive responsibility of other public agencies while they should just take care of port operations administration.

[345] Figure modified from the original, Brazilian Ministry of Transportation: http://www.transportes.gov.br/ accessed 15 May 2007.

A great number of the port authorities have not yet convinced themselves that, beyond the management of ports as an economically strategic business, it is also up to them to take care of the environment that is an integral and inseparable part of the port areas under their responsibility. In fact, this is one of their duties established by the Federal Law n^{o} 8630/1993 (Law of Ports): "It is responsibility of the Port Administration, within the limits of the port area […][346] inspect port operations, to ensure that services are carried out with regularity, efficiency, safety and respect for the environment. […]"[347]

Therefore, the environmental component should also be seen as one of the main purposes of the role of port authorities, which should adopt and implement a more modern and sustainable approach to port management. As will be outlined below, one of the adequate strategies to reach this goal would be the adoption of a Port Environmental Agenda, mainly through the implementation of specific units of environmental management in the administrative structure of the port.

As far as the requirements of the environmental legislation are concerned, a great part of them are prescribed through the environmental licensing process of the ports and these units of environmental management are essential for the correct obedience of all environmental conditions made by the competent agencies. The environmental licensing process and its application on the BWM are elaborated below.

5.2.1 Ballast water discharges in Brazil

Taking into consideration that most of the Brazilian port authorities have not yet adopted ideal environmental management systems, favorable conditions for alien species survive in port areas. Furthermore, the lack of more effective national BWM measures than the inadequate ballast water discharges control, and the considerable growth in the international trade in the last years, all lead to believe that the Brazilian port areas are under great risks of biological invasions.

Figure 16 below - based on data from Table 9 - shows the growth of the total annual loads moved by Brazilian ports and terminals between 1994 and 2006. The clear increase in total

[346] Article 33 (1), Federal Law n^{o} 8630/1993.
[347] Article 33 (VII), Federal Law n^{o} 8630/1993.

load exported from Brazil and moved by cabotage[348] between Brazilian ports may be correlated with a corresponding important increase in the amount of ballast water imported and number of alien species dispersed in Brazilian coastal waters. In 2006, the voyages for international trade corresponded to 72.58% of the total cargo handling. The cabotage represented 23.6% and other types[349] of navigation accounted for 3.81% of that total. These "other types" of navigation mostly correspond to internal waters (continental waterways) navigation.

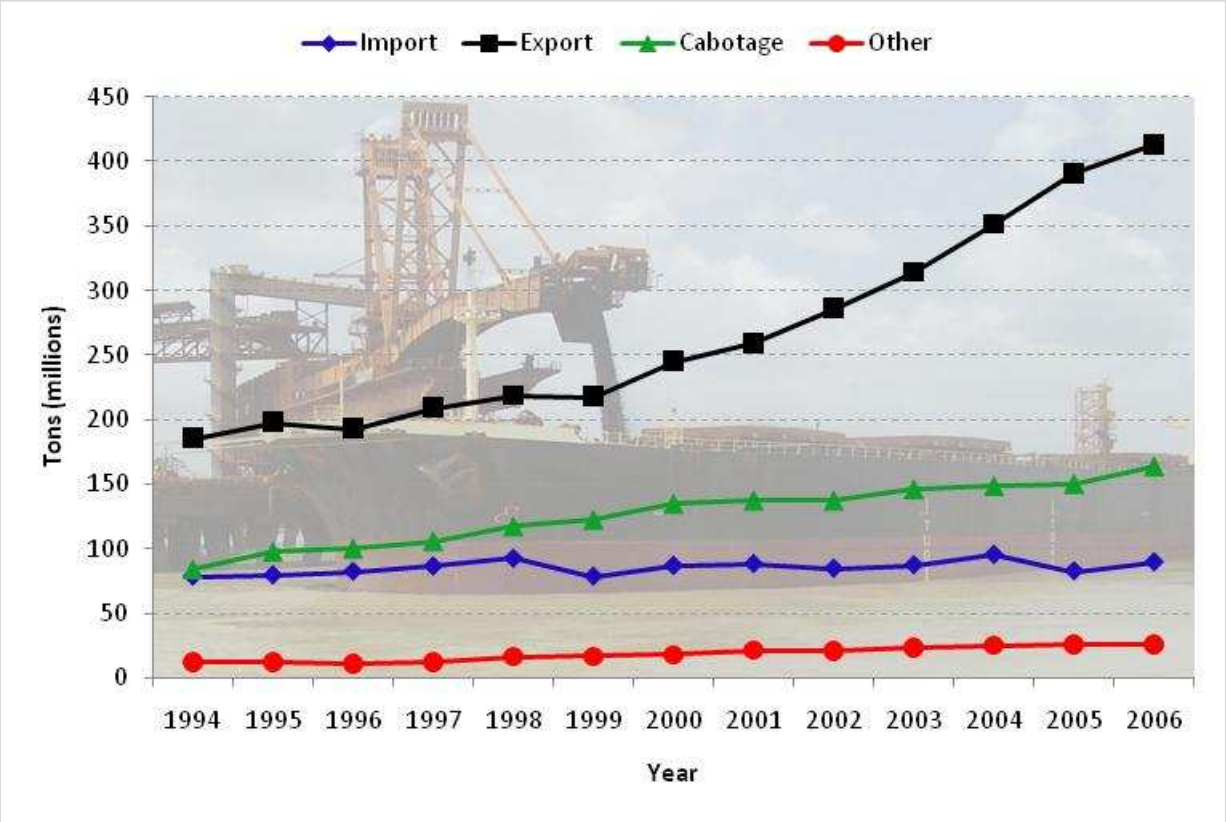

Figure 16. Evolution of Loads Moved by Brazilian Ports and Private Terminals 1994-2006

[348] Cabotage: Is the water transportation term applicable to shipments between two or more ports of the same nation; commonly refers to coastwide navigation or trade. Coastwise and intercoastal navigation and trading. In: Jeffrey W. Monroe and Robert J. Stewart, Dictionary, *op cit*. p. 69.
[349] Fluvial, lacustrine, and offshore navigations, this last one for supporting oil platforms.

Table 9. Evolution of Loads Moved by Brazilian Ports and Private Terminals 1994-2006[350]

Year	International Trade			Cabotage	Other	Total
	Import	Export	Total			
1994	78,757,173	185,291,170	264,048,343	84,248,720	12,121,037	360,418,100
1995	79,731,597	197,954,671	277,686,268	97,827,217	12,175,503	387,688,988
1996	82,593,139	192,888,982	275,482,127	100,216,395	10,685,515	386,384,037
1997	86,719,971	209,330,502	296,050,473	105,850,267	12,339,025	414,239,765
1998	92,821,708	218,272,797	311,094,505	117,339,836	16,570,283	445,004,624
1999	78,774,565	217,810,566	296,585,131	122,466,040	16,658,726	435,709,897
2000	87,188,722	244,929,929	332,118,651	134,656,001	17,885,988	484,660,640
2001	88,561,904	258,967,816	347,529,720	137,267,499	21,409,665	506,206,884
2002	85,013,102	285,769,836	370,782,938	137,023,807	21,198,306	529,005,051
2003	87,715,381	313,880,887	401,596,268	145,926,525	23,267,262	570,790,055
2004	95,830,852	351,305,369	447,136,221	148,418,917	25,165,407	620,720,545
2005	82,962,578	390,094,843	473,057,421	150,112,048	26,249,312	649,418,781
2006	**90,010,736**	**412,908,583**	**502,919,319**	**163,520,202**	**26,393,947**	**692,833,468**

The Table 10 below presents some coefficients calculated by the URS Australia Pty Ltd[351] for different types of vessels estimating their discharges of ballast waters according to the weight of cargo loaded, unloaded, and both.

[350] Source: National Agency for Waterway Transportation (ANTAQ).

[351] The Ballast Water Risk Assessment Activity for the Port Sepetiba was conducted by URS Australia Pty Ltd (URS) under contract to the GloBallast. In: Chris Clarke *et al*, GloBallast Monograph Series nº 14. 2003.

Table 10. Ballast water coefficients according the type of ships[352]

Ship Type	Lloyds Ship Type Code	Cargo Loading	Cargo Unloading	Both
General bulk carrier	**A21A**	**38.0%**	**2.0%**	**5.0%**
Woodchip carrier	**A24B**	**36.0%**	**0.0%**	**0.0%**
Crude oil tanker	**A13A**	**35.0%**	**0.0%**	**3.2%**
Products tanker	**A13B**	**35.0%**	**3.2%**	**5.5%**
Ore Carrier	**A21B**	**34.0%**	**0.0%**	**0.0%**
Grain carrier	**A23A**	**30.0%**	**0.0%**	**0.0%**
Chemical tanker	**A12A**	**28.5%**	**3.2%**	**5.5%**
LPG tanker	**A11B**	**26.0%**	**0.0%**	**3.2%**
Ro-Ro ship	A35A	18.0%	1.0%	9.0%
Vehicles carrier	A35B	18.0%	0.0%	3.0%
General cargo ship	**A31A**	**17.0%**	**3.5%**	**7.0%**
Vegetable oil tanker	**A14D**	**16.0%**	**0.0%**	**3.2%**
Container ship	**A33A**	**15.0%**	**0.0%**	**1.0%**
Livestock carrier	A38A	15.0%	0.0%	0.0%
Refrigerated cargo ship	A34A	8.5%	0.0%	0.0%
Landing craft	A35B	2.5%	0.0%	0.0%
Passenger vessel	A37D	0.0%	0.0%	0.0%
Other	-	No data	No data	No data

As previously discussed, oil tankers and bulk carriers are responsible for most of the total ballast water volumes transported globally. This concurs with the higher coefficients associated to the most important types of solid bulk carriers and tanker vessels, whose coefficients are higher than 26% of the loaded cargo. Therefore, as most of the cargo handled by Brazilian ports corresponds exactly to solid and liquid bulk products (Figure 17 and Table 11), the total volume of ballast water discharged and uptaken in their areas is expected to be elevated. The subsequent Table 12 details the principal composition of loaded and unloaded cargoes in Brazilian ports in 2006.

[352] URS Australia Pty Ltd, provided to author by GloBallast Brazil, 13 November 2007. The coefficients were estimated for the GloBallast Programme and they are based on mean values for three years of ship discharge data at the Port of Melbourne, at the north of Port Phillip Bay, Victoria State, Australia.

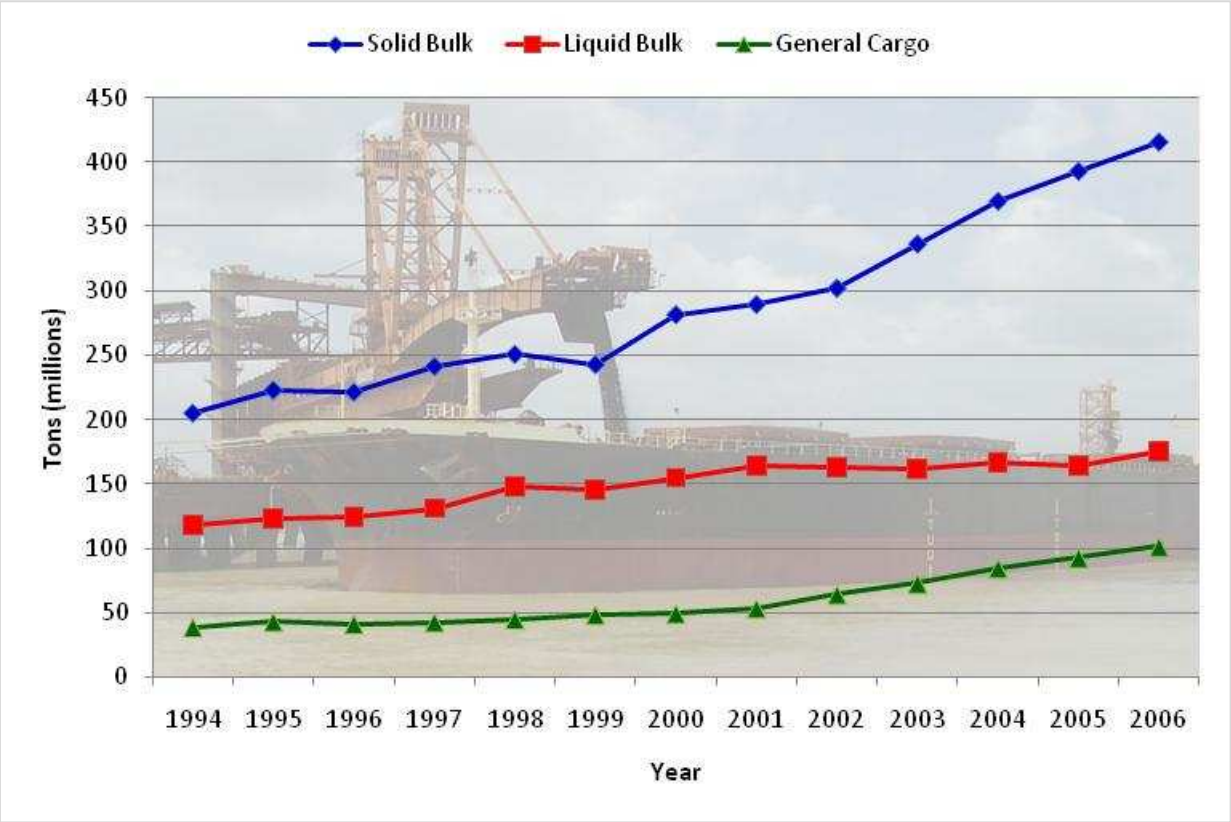

Figure 17. Graphic of the Evolution of Cargo Handling by Type in 1994-2006

Table 11. Evolution of Cargo Handling by Type and Total in 1994-2006[353]

Year	Solid Bulk	Liquid Bulk	General Cargo	Total
1994	204,626,109	117,706,425	38,085,566	360,418,100
1995	222,539,904	122,657,844	42,491,240	387,688,988
1996	221,089,725	124,509,678	40,784,628	386,384,031
1997	241,121,714	130,878,306	42,239,745	414,239,765
1998	250,469,331	148,010,962	44,524,301	443,004,594
1999	242,505,100	145,254,561	47,950,236	435,709,897
2000	281,292,313	154,555,572	48,812,755	484,660,640
2001	289,265,117	163,986,765	52,955,002	506,206,884
2002	301,972,374	163,135,324	63,897,353	529,005,051
2003	336,276,308	161,886,081	72,627,666	570,790,055
2004	369,611,250	166,555,087	84,554,208	620,720,545
2005	392,903,932	163,717,494	92,797,355	649,418,781
2006	**415,727,739**	**175,541,324**	**101,564,405**	**692,833,468**

[353] Source: ANTAQ.

Table 12. Main type of loads, by direction, handled in the Brazilian Ports and Private Terminals in 2006[354]

Cargo Loading		Cargo Unloading		Total	
Product	**tons**	**Product**	**tons**	**Product**	**tons**
Iron ore	248,986,383	Petroleum	78,764,564	Iron ore	249,656,570
Soybean	29,656,081	Mineral coal	15,338,902	Petroleum	96,013,132
Petroleum	17,248,568	Bauxite	13,175,533	Soybean	32,843,120
Sugar	15,914,206	Fertilizers	10,647,864	Sugar	15,933,323
Steel products	11,108,226	Diesel oil	6,520,498	Diesel oil	15,747,201
Soybean meal	9,951,773	Wheat	6,373,621	Mineral coal	15,702,987
Diesel oil	9,226,703	Naphtha	5,487,340	Bauxite	13,188,797
Cellulose	5,925,179	Salt	3,667,472	Fertilizers	11,641,197
Pig Iron	5,854,386	Soybean	3,187,039	Steel products	11,246,049
Wood*	4,590,380	Petroleum Coke	2,612,600	Soybean meal	10,391,297
Corn	4,276,007	Caustic soda	2,297,861	Wheat	7,334,912
Pellets	4,113,634	Fuel oil	2,213,611	Cellulose	7,128,099
Alumina**	3,600,872	Wood	1,908,836	Wood	6,499,216
Gasoline	3,235,898	GLP	1,503,093	Naphtha	6,020,316
Fuel oil	3,007,480	Gasoline	1,210,384	Pig Iron	5,854,386
Soy oil	2,222,178	Cellulose	1,202,920	Salt	5,738,925
Frozen poultry	2,204,150	Iron ore	670,187	Fuel oil	5,221,091
Ethanol	2,169,032	Corn	657,792	Corn	4,933,799
Salt	2,071,453	Aviation kerosene	656,752	Gasoline	4,446,282
Kaolinite	1,695,755	Soybean meal	439,524	Pellets	4,113,634
Citrus juice	1,447,888	Manganese ore	310,045	Alumina	3,692,550
Sulfur	1,413,644	Rice	191,660	Caustic soda	3,052,411
Manganese ore	1,382,818	Ethanol	149,482	Petroleum Coke	2,612,600
Fertilizers	993,333	Steel products	137,823	Ethanol	2,318,514
Wheat	961,291	Cement	111,076	Soy oil	2,240,969
Chlorides	868,289	Alumina	91,678	Frozen poultry	2,217,048
Cement	778,132	Chlorides	21,063	GLP	1,831,441
Caustic soda***	754,550	Sugar	19,117	Kaolinite	1,701,763
Aluminum	682,648	Soy oil	18,791	Manganese ore	1,692,863
Naphtha	532,976	Frozen poultry	12,898	Citrus juice	1,447,888
Clinker	531,199	Kaolinite	6,008	Sulfur	1,413,644
Fruits diverse	423,845	Other	51,917,086	Chlorides	889,352
Mineral coal	364,085			Cement	889,208
GLP	328,348			Aviation kerosene	879,454
Rice	277,978			Aluminum	682,648
Aviation kerosene	222,702			Clinker	531,199
Bauxite	13,264			Rice	469,638
Other	82,275,014			Fruits diverse	423,845
				Other	134,192,100
Total	**481,310,348**	**Total**	**211,523,120**	**Total**	**692,833,468**
***** By bulk and other, ** aluminum oxide, *** sodium hydroxide					

In 2006, the majority of the loaded cargo was composed of dry bulk, mainly iron ore and soybeans, while petroleum was the most important unloaded product. For the same period, the imports corresponded to 42.55% of the total unloaded cargo while exports corresponded to

[354] Source: ANTAQ.

85.79% of the total loaded cargo. In addition, 78.18% of the cargo exported from Brazil in terms of weight (322,795,169 tones) corresponded to solid bulk, 6.35% (26,234,324 tones) to liquid bulk, and 15.47% (63,879,090 tones) to general cargo.[355] On the other hand, for the same year, the total imported cargo was composed of 46.60% (41,942,665 tones) of solid bulk, 29.44% (26,503,311 tones) of liquid bulk, and 23.96% (21,564,760 tones) of general cargo. These values result in exceeding weights of 280,852,504 tones of exported solid bulk, 268,987 tones of imported liquid bulk, and 42,314,330 tones of exported general cargo.

Therefore, as can be seem in Figure 18, Brazil currently occupies an important position in the international traffic of bulk carrier vessels, mainly exporting solid bulk loads and consequently importing great volumes of ballast water through this type of vessels. Regarding liquid bulk cargoes, at the moment Brazil does not have the same significant participation in the international voyages of tankers (Figure 19) and it currently seems that, even if not significant, this type of ship mostly exports ballast water from its ports.

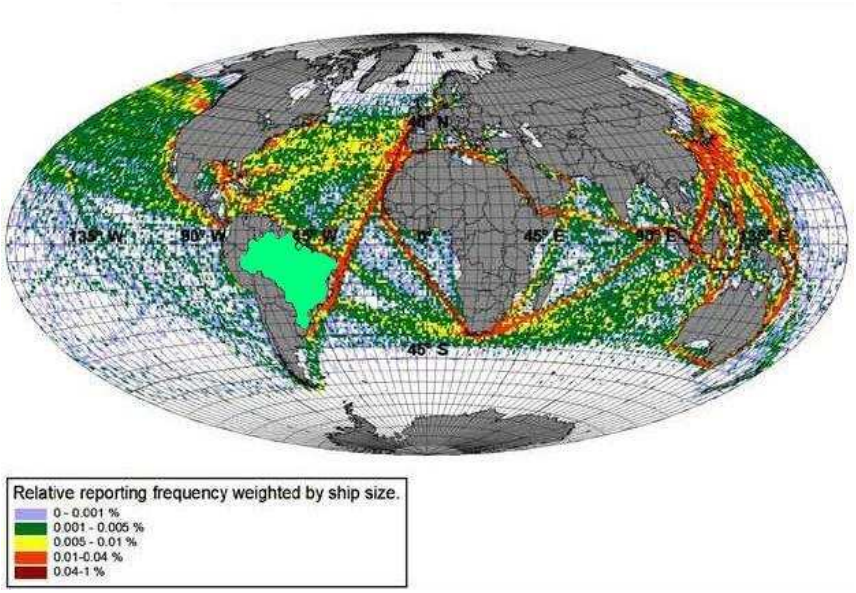

Figure 18. Traffic density of bulk carrier vessels for 2000[356]

[355] General cargo: Corresponds to commodities that are usually unitized, boxed, bagged, crated, etc., and normally require handling by piece, unit load or in separate drafts. Also, miscellaneous commodities shipped in various types of packaging of irregular size and weight, or of regular uniform size and weight. The shipping and handling techniques can be as break bulk, containerized, or neobulk general cargo. In: Jeffrey W. Monroe and Robert J. Stewart, Dictionary, *op cit*. p. 195. The data from ANTAQ on general cargo encompass also the weight of all containerized cargo.

[356] Figure modified from AMVERdata (AMVER, 2001) in Øyvind Endresen *et al*, Challenges in, *op cit*. p. 617. Currently, it is expected a change in this South-North pattern to also West-East due to the increase in trade between Brazil and eastern States in Asia (mainly China and India) and Africa in the last few years.

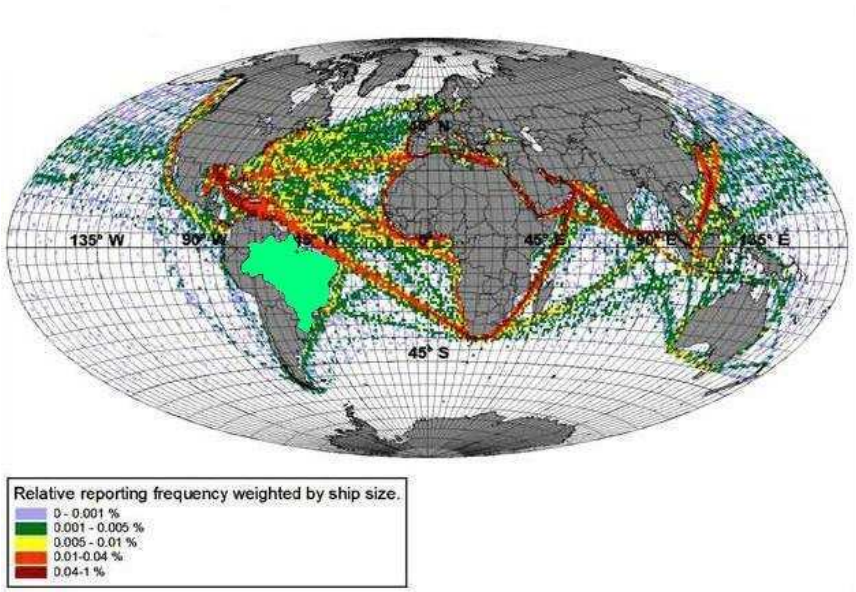

Figure 19. Traffic density of oil tanker vessels for 2000[357]

However, it is expected that the Brazilian balance of trade related to petroleum will radically change in the next three or four years since this is the time estimated as necessary for the recently discovered huge "Tupi" oil field to start being commercially explored. This field, in addition to other fields already found and new fields expected to be revealed in the Brazilian territorial sea and EEZ, has been estimated to be large enough to place Brazil in the group the of world's ten major oil exporters.[358] Therefore, a consequent increase in the total traffic of ballast water in Brazil can be expected.

Furthermore, it can be predicted that the transport of ballast water and its environmental implications will increase and diffuse even more through the Brazilian aquatic environments as a result of some new policy and initiatives already undertaken by Government and private

[357] *Ibid.*

[358] Temporarily named as "Tupi" – the name will probably be changed in 2009 to a name of a marine organism – this offshore oil field is expected to contain between 5 and 8 billion barrels, a quantity that would raise the national production by 40%. However, due to its location (under around 2,000 meters of water, 3,000 meters of sand and rocks, and a 2,000 meter layer of salt) the technological resources necessary for its exploitation would be available only in 2010 or 2011. If these predictions became true the discharges of ballast water onto the Brazilian coast would raise significantly, mainly in ports like Aratu, which already serves the Petrochemical Pole of Camaçari, Transpetro oil terminals (Petrobras Transporte S.A.), and Suape which is expected to accommodate a new oil refinery.

institutions to improve the cabotage, expand the national continental waterways;[359] enlarge the operational capacity of ports,[360] and built new port terminals.[361] Therefore, it is crucial that such developments in the national port system and waterway transportation occurs in conjunction with the adoption of necessary and compatible measures to protect the aquatic environments, including the improvement of the national BWM program.

Depending on the nature of the cargo, the demands of the ports hinterland,[362] and the local port operational characteristics, many bulk carriers arrive in Brazil empty or only partially loaded with goods. Considering that at least the aforementioned 280,852,504 tones of exported solid bulk could not be compensated by unloaded cargo but only by ballast water discharges, and adopting an average coefficient of 32% (between Ore Carrier and Grain Carrier vessels), it is possible to roughly estimate that around 89,872,801 tons of ballast water has been imported by Brazil in 2006 just by bulk carriers.

In 2006, commercial navigation in Brazil was composed of at least 17,966 ships engaged in the international trade, 4,639 ships in cabotage, and 9,393 ships in other types of sailing.[363] The significant raise in the Brazilian exports, mainly represented by solid bulk cargo, shows that Brazil has the tendency to be a ballast water importer. However this ballast water input would not be equally distributed along the Brazilian coast line, but more concentrated in a few ports. The next section outlines the main ballast water import and export ports in Brazil.

5.2.1.1 Brazilian ports and states with higher potential to import ballast water

The Brazilian ports and terminals that in principle would have imported a greater volume of ballast water in 2006 due to solid bulk exports would be: Tubarão, Ponta da Madeira, Terminal

[359] The current total extension of the Brazilian continental waterway system is about 12,000 km, with a potential to expand and reach 43,000 km through projects and investments in dreading operations and construction of new ship locks.
[360] Through the Program for Acceleration of the (Economic) Growth (PAC), about R$ 2.7 billion (R$ - Reais, approximately US$ 1.54 billion as US$ 1.00 = R$ 1.75) were destined for projects improving the efficiency of the Brazilian ports. A great part of these resources is directed to dreading operations in 12 of the most important ports, and is expected that it will be applied until 2010.
[361] Embraport Terminal in Santos (São Paulo), Portonave Terminal in Itajaí (Santa Catarina), Itapoá Terminal in the Babitonga Bay (Santa Catarina), Açu Terminal (Rio Grande do Sul), Porto Brasil (São Paulo).
[362] Hinterland: the area served by a tributary to a port, where a port's exports are produced and its imports are marked. In: Jeffrey W. Monroe and Robert J. Stewart, Dictionary, *op cit*. p. 212.
[363] Source of the data: ANTAQ.

of Ilha Guaíba,[364] Itaguaí, Santos, Ponta Ubu and Paranaguá. The exports of solid bulk cargo from these seven ports exceeded 10 million tons in 2006. Table 13 below shows the exported weight of solid bulk cargo from all Brazilian ports and terminals whose exports of such type of cargo were over one million tons in 2006.

Table 13. Major Brazilian ports and terminals loading solid bulk for international trade in 2006[365]

State	Port or Terminal	Exported Cargo (ton)
ES	Tubarão	92,184,127
MA	Ponta da Madeira	71,060,585
RJ	Terminal of Ilha Guaíba	45,141,546
RJ	Itaguaí	21,775,166
SP	Santos	19,086,694
ES	Ponta Ubu	15,963,507
PR	Paranaguá	14,859,205
RS	Rio Grande	6,537,700
MA	Itaqui	5,843,750
MA	Alumar	5,784,145
PA	Porto Trombetas - MRN	4,931,694
SC	São Francisco do Sul	3,828,596
PA	Vila do Conde	3,064,380
AL	Maceió	1,732,708
ES	Vitória	1,668,881
AM	Itacoatiara (Hermasa)	1,597,647
AP	Santana	1,275,827

Considering the exports of all Brazilian port states, represented by the sum of dry bulk exports made by their respective ports and terminals, the following states would be the most important ballast water importers: Espírito Santo (109,816,515 tons), Maranhão (82,688,480 tons), Rio de Janeiro (66,916,712 tons), São Paulo (19,086,694 tons), Paraná (14,859,205 tons), Pará (9,612,741 tons), Rio Grande do Sul (5,843,750 tons), Santa Catarina (3,828,596 tons), Alagoas (1,732,708 tons), Amazonas (1,597,647 tons), and Amapá (1,275,827 tons). The number of tons between parentheses represents the total export of dry bulk. All these states showed dry bulk exports over one million tons in 2006.

[364] Minerações Brasileiras Reunidas S/A. (MBR), in Mangaratiba (RJ), owned by Companhia Vale do Rio Doce (VALE).
[365] Source: ANTAQ.

For liquid bulk, Table 14 below shows the Brazilian ports and terminals that in principle would have imported the greater volumes of ballast water in 2006 due to exports of this type of cargo. The table only considers ports and terminals whose exports were over one million tons in 2006. Considering all the states' exports of liquid bulk, the following states would be the most significant importers of ballast water due to this type of cargo: Rio de Janeiro (8,189,074 tons), São Paulo (8,096,675 tons), Bahia (4,406,356 tons), Paraná (2,350,203 tons), and Rio Grande do Sul (1,728,921 tons). The number of tons between parentheses represents the total export of liquid bulk.

Table 14. Major Brazilian ports and terminals loading liquid bulk for international trade in 2006[366]

State	Port or Terminal	Exported Cargo (ton)
RJ	Almte. M. Fonseca - Petrobrás	6,733,424
SP	Santos	6,128,868
BA	Amte. Alves Câmara	3,475,577
PR	Paranaguá	2,350,203
SP	Amte. Barroso - Petrobrás	1,455,498
RJ	Ilha D'água e Ilha Redonda - Petrobrás	1,428,660
RS	Rio Grande	1,280,600

Table 15 below shows the Brazilian ports and terminals that in principle would have imported the greater volumes of ballast water in 2006 due to exports of general cargo. The table only considers ports and terminals whose exports of such type of cargo were over one million tons in 2006. Considering all the states' exports of general cargo, the following states would be the most significant importers of ballast water for this case: São Paulo (20,013,442 tons), Espírito Santo (13,696,056 tons), Rio de Janeiro (7,507,064 tons), Santa Catarina (7,061,538 tons), Paraná (5,395,194 tons), Rio Grande do Sul (3,763,924 tons), Pará (2,249,061 tons), and Bahia (1,415,980 tons). The number of tons between parentheses represents the total export of general cargo.

[366] Source: ANTAQ.

Table 15. Major Brazilian ports and terminals loading general cargo for international trade in 2006[367]

State	Port or Terminal	Exported Cargo (ton)
SP	Santos	18,442,876
ES	Praia Mole	5,759,689
PR	Paranaguá	4,939,791
SC	Itajaí	4,789,505
RJ	Rio de Janeiro	4,649,621
ES	Barra do Riacho	4,329,062
RS	Rio Grande	3,760,582
ES	Vitória	3,607,305
RJ	Itaguaí	2,709,169
SC	São Francisco do Sul	1,656,374
SP	Usiminas	1,555,150
BA	Salvador	1,415,980
PA	Vila do Conde	1,015,943

5.2.1.2 Brazilian ports and states with the higher potential to export ballast water

Table 16 below shows the Brazilian ports and terminals that in principle would have exported the greater volumes of ballast water in 2006 due to solid bulk imports. The table only considers ports and terminals whose imports of such type of cargo were more than one million tons in 2006. Considering all the states' imports of solid bulk cargoes, the following states would be the most significant exporters of ballast water for this case: Espírito Santo (12,491,387 tons), São Paulo (9,092,797 tons), Paraná (5,191,158 tons), Rio de Janeiro (3,942,552 tons), Rio Grande do Sul (3,155,031 tons), Bahia (1,815,836 tons), Santa Catarina (1,246,482 tons), Maranhão (1,159,596 tons), and Pernambuco (1,156,703 tons). The number of tons between parentheses represents the total import of solid bulk cargo.

[367] Source: ANTAQ.

Table 16. Major Brazilian ports and terminals unloading solid bulk for international trade in 2006[368]

State	Port or Terminal	Imported Cargo (ton)
ES	Praia Mole	10,766,169
PR	Paranaguá	5,153,512
SP	Santos	3,856,459
RJ	Itaguaí	2,984,468
SP	Usiminas	2,911,367
RS	Rio Grande	2,714,238
SP	Ultrafértil S.A.	1,874,096
BA	Aratu	1,262,608
PE	Recife	1,131,572
ES	Tubarão	1,055,527

Table 17 below shows the Brazilian ports and terminals that in principle would have exported the greater volumes of ballast water in 2006 due to liquid bulk imports. The table only considers ports and terminals whose imports of such type of cargo were more than one million tons in 2006. Considering all the states's imports of liquid bulk cargoes, the following states would be the most significant exporters of ballast water for this case: São Paulo (8,458,149 tons), Rio Grande do Sul (6,532,753 tons), Rio de Janeiro (2,857,006 tons), Santa Catarina (2,530,623 tons), Maranhão (2,088,314 tons), and Bahia (1,671,681 tons). The number of tons between parentheses represents the total import of liquid bulk cargo.

Table 17. Major Brazilian ports and terminals unloading liquid bulk for international trade in 2006[369]

State	Port or Terminal	Imported Cargo (ton)
SP	Amte. Barroso - Petrobrás	6,266,138
RS	Almte. Soares Dutra – Tramandaí	5,479,181
SC	DT-SUL - Petrobrás	2,500,101
RJ	Almte. M. Fonseca - Petrobrás	2,465,186
MA	Itaqui	1,902,975
SP	Santos	1,881,888
BA	Aratu	1,270,148

Table 18 below shows the Brazilian ports and terminals that in principle would have exported the greater volumes of ballast water in 2006 due to general cargo imports. The table

[368] Source: ANTAQ.
[369] Source: ANTAQ.

only considers ports and terminals whose imports of such type of cargo were more than one million tons in 2006. Considering all the states' imports of general cargo, the following states would be the most significant exporters of ballast water for this case: São Paulo (9,558,931 tons), Rio de Janeiro (2,919,261 tons), Santa Catarina (2,107,006 tons), Paraná (1,498,601 tons), Rio Grande do Sul (1,468,448 tons), and Espírito Santo (1,411,861 tons). The number of tons between parentheses represents the total import of general cargo.

Table 18. Major Brazilian ports and terminals unloading general cargo for international trade in 2006[370]

State	Port or Terminal	Imported Cargo (ton)
SP	Santos	9,545,099
RJ	Rio de Janeiro	1,882,582
SC	Itajaí	1,539,667
PR	Paranaguá	1,498,601
RS	Rio Grande	1,446,956
ES	Vitória	1,406,459
RJ	Itaguaí	1,016,860

These most significant values presented for what would be the most important Brazilian ports, terminals and states on the international traffic of ballast water in Brazil in 2006 are not sufficient to permit a complete estimation on the correspondent volumes of ballast water uptake and discharged. The data provides only an idea of the principal ballast water destinations and origins in Brazil. For a valid estimate of the volumes of ballast water imported and exported in those locations there is a need for a more detailed analysis of the ports' operational dynamics, since the entire weight of cargo loaded or unloaded is not necessarily compensated only with ballast water discharge or uptake.

A ship from a foreign port could unload its cargo in a Brazilian port while loading another type of product for export. In this case, the volume of ballast water exchanged probably would be overestimated if the above coefficients were used. Thus, it is necessary to consider factors

[370] Source of the data: ANTAQ.

such as rates of backhaul[371] and headhaul[372] that can be very distinct for each port. It could be expected that in ports such as Santos, which operate with a great variety of products of all type of cargoes, and has both significant export and import volumes, less ballast water would be necessary to compensate the cargoes handling. On the other hand, in ports or terminals, such as Tubarão and Ponta da Madeira, predominantly exporters of great volumes of just one of a few types of cargoes, the import of impressive volumes of ballast water could be expected, and in this case, the estimates made by using the coefficients would be more correct.

Therefore, for a more accurate estimation of the imported and exported volumes of ballast water in Brazil, it would be necessary to combine an analysis of information from local ports' operations, comprising the exact composition of the fleet that reaches Brazilian ports and data on loading and unloading cargoes, with the data of BWRF submitted by all ships. However, just a few similar studies have been undertaken in Brazil,[373] and as outlined in the following sections of this chapter, great part of the BWRF have mistakes, false data or gaps that sometimes make them unhelpful. In addition, the Governmental institutions responsible for their analysis do not have the necessary structure to maintain an updated database, and the access to the BWRF by other interested institutions may not be so easy.

5.3 Brazilian Governmental Institutions

The main Governmental institutions directly involved with matters regarding ports and shipping activities in Brazil include the Maritime Authority, the Ministry of Transportation

[371] Backhaul: To haul a shipment back over part of a route that it has already travelled; a marine transportation carrier's return movement of cargo, usually opposite from the direction of its primary cargo distribution. In: Jeffrey W. Monroe and Robert J. Stewart, Dictionary, *op cit*. p. 31.

[372] The opposite of backhaul, when carrier's return empty for its origin from the port where the cargo was unloaded, or when they sail empty just to load cargo in the port of call, retuning full to the port of origin. In this case the volumes of ballast water transported are significantly higher.

[373] The Alarm Project (not yet published) found that in 2003 approximately 7,600,000 tons were imported and 2,600,000 tons were exported by the port of Paranaguá. The study undertook for the GloBallast Programme in the port of Itaguaí (Sepetiba) using BWRFs submitted between January 2001 and June 2002 and other additional data from port shipping records from 1998-2000 found that 11,652,829 tons of ballast water were discharged from the identified source ports (Chris Clarke *et al*, GloBallast Monograph Series n^{o} 14. Ballast Water Risk Assessment, Port of Sepetiba, Federal Republic of Brazil, December 2003: Final Report). Another study using BWRFs from 2003 estimated a volume of 761,048 tons of ballast water discharged in the port of Itajaí (Altevir Caron Junior, Avaliação do Risco de Introdução de Espécies Exóticas no Porto de Itajaí e Entorno por Meio de Água de Lastro. Dissertação apresentada como requisito parcial à obtenção do título de Mestre em Ciência e Tecnologia Ambiental, Curso de Pós-Graduação Stricto Sensu em Ciência e Tecnologia Ambiental, centro de Ciências Tecnológicas da Terra e do Mar, Universidade do Vale do Itajaí. Orientador: Dr. Luís A. de Oliveira Proença. Itajaí, 2007).

(MT), the National Agency for Waterway Transportation (ANTAQ), the Special Secretariat for Ports (SEP), the Ministry of Environment (MMA), the National Health Surveillance Agency (ANVISA), the Brazilian Institute for the Environment and Natural Renewable Resources (IBAMA), and all state environment agencies. The mandates of these organizations, mainly those related with environmental matters, will be outlined in the following sections so as to give a panorama of the Brazilian Governmental structure related to the regulation and promotion of shipping and port activities.

5.3.1 Maritime Authority

The Maritime Authority, directly represented by the Commander of the Brazilian Navy,[374] is responsible for the safeguard the human life and for preserving the security of navigation on open seas and inland waterways. Moreover, the Maritime Authority must also establish the conditions necessary to prevent marine pollution by ships, platforms or by its support installations.[375] Part of these duties is performed by its Directorate of Ports and Costs (DPC)[376] that is responsible for the execution of inspections on ships to verify aspects regarding security and marine pollution.[377] Another important duty of the DPC is to elaborate Norms of Maritime Authority (NORMAM), which are legal instruments that are more agile and dynamic than federal laws or acts. Thus, as it will be presented in the following pages, the Brazilian Maritime Authority, through its DPC, established a specific norm for the management of ballast water regarding ships (NORMAM-20).[378]

The Maritime Authority is also responsible for directing the Brazilian Coordinating Commission on IMO Matters (CCA-IMO).[379] The duty of the CCA-IMO is to consolidate the positions to be adopted by the Brazilian delegations regarding to IMO. Moreover, the CCA-IMO also has the mandate to propose guidelines and recommend measures for the internalization of the commitments assumed by Brazil in the scope of IMO, mainly those regarding maritime security and the prevention of marine pollution. The Executive Secretariat (Sec-IMO) of the CCA-IMO is responsible for analyzing matters and formulating proposals to

[374] Website of the Brazilian Navy: https://www.mar.mil.br/.
[375] Article 4 (VII), Brazilian Federal Law nº 9537/1997, Law of the Waterways Traffic Security (LESTA).
[376] Website of the DPC: https://www.dpc.mar.mil.br/.
[377] Article 2, Chapter II, DPC's Official Regulation.
[378] Norm of the Maritime Authority for the Management of the Ballast Water of Ships (NORMAM-20).
[379] Website of the CCA-IMO: https://www.ccaimo.mar.mil.br/.

be submitted to the CCA-IMO's Consultant Forum. This Forum is composed of representatives of the maritime community, scientific and sectorial entities, Governmental and non-governmental organizations, and by people with knowledge of CCA-IMO's matters, such as consultants and experts. Once the Brazilian position is decided, it has to be politically analyzed and approved by the Inter-ministerial Group of the CCA-IMO, composed by representatives from the Brazilian Navy, the Ministries of Justice, Foreign Affairs, Transportation, Mines and Energy, Planning, Budget and Management, Communications, and Environment.

The Maritime Authority is also represented by the Admiral Paulo Moreira Institute of Marine Studies (IEAPM)[380] that is the marine research section of the Brazilian Navy. It is responsible for developing projects in the fields of oceanography and oceanic engineering, with the purpose of promoting scientific and technologic developments for the naval operations of the Brazilian Navy. Moreover, the IEAPM researches and evaluates the effects of ballast water and sediment discharges in national coastal waters, and develops measures and ships' operational procedures that could be adopted for the national approach on ballast water management. Therefore, the role of the IEAPM in any working group for discussing and developing new regulations on BWM is essential.

The IEAPM is also responsible for receiving and analyzing copies of the BWRF delivered by the vessels' commanders at all Brazilian ports.[381] The BWRF reporting procedure is detailed in the following pages. Since 2000 the IEAPM has biannually promoted the Brazilian Seminar on Ballast Water (SBAL). The seminar gathers representatives of the Maritime Authority, ports, regulatory agencies, ship owners, researchers and students with the objective to present studies and discuss matters related to the control and management of ballast water.

In addition to the above, the Maritime Authority also coordinates the Inter-ministerial Commission of Sea Resources (CIRM)[382] whose mandate is to implement the goals of the National Policy for the Resources of the Sea (PNRM).[383] The members of the CIRM include

[380] Website of the IEAPM: http://www.ieapm.mar.mil.br/.
[381] Chapter 2, Section 2.3.2 – Sending of the Ballast Water Reporting Form, of the NORMAM-20.
[382] Created by the Brazilian Federal Decree n^{o} 74557/1974 and regulated by the Federal Decree n^{o} 3939/2001. Website of the CIRM: https://www.mar.mil.br/secirm/.
[383] The general guidelines for the PNRM were first adopted by the Brazilian Government in 1980. However, due to significant changes in the national and international scenario in matters related to oceans and coastal areas,

representatives of the Brazilian Navy Command and of various other Ministries.[384] In 1998, the CIRM approved a draft of a "Port Environmental Agenda,"[385] establishing principles and instruments of action, as well as a program of activities to reach the following six basic goals:

- To promote the environmental control of port activity;

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mainly because the entry into force of UNCLOS in November 1994, the PNRM was reviewed and updated through the Federal Decree nº 5377/2005. According to the second section of this law, the purpose of the PNRM is to guide the development of activities aimed at the effective utilization and exploitation of mineral, energetic, and living resources of the territorial sea, the EEZ and the continental shelf according to national interests; in a rational and sustainable manner that promote the socioeconomic development of the country; generating jobs and income and contributing to social inclusion. Therefore, the PNRM focuses primarily on the establishment of principles and objectives for the preparation of governmental plans, programs and actions for training human resources, developing research, science and marine technology, and conducting sustainable exploitation and utilization of marine resources; and on the definition of actions to achieve the goals established in this policy.

The PNRM is consolidated in multiannual and annual plans and programs prepared by the CIRM, which unfold in specific projects that are the basic work programmes. These projects are approved by the CIRM and the necessary resources are provided by diverse agencies, by agreement, to implementing institutions (universities, research institutes and Government organizations linked to the resources of the sea) according to the development of the project's phases. The multiannual and annual plans and programs include:

- The Sectorial Plan for the Resources of the Sea (PSRM), which has as a main objective the identification and assessment of the capability of living and non-living resources of marine areas under national jurisdiction and adjacencies, for the management and sustainable use of these resources. In the same context, the following programs are also developed: Evaluation of the Sustainable Potential of the Living Resources of the Exclusive Economic Zone Program (REVIZEE), the Global Ocean Observing System (GOOS, sponsored by the Intergovernmental Oceanographic Commission - IOC, UNEP, the World Meteorological Organization - WMO and the International Council for Science - ICSU), Program of Sea Mentality, Train-Sea-Coast Brazil Program, and Program Archipelago;
- The National Plan of Coastal Management (PNGC) was established by Federal Law nº 7661/1988, which was later regulated by the Federal Decree nº 5300/2004. The details of the first version of the PNGC were the subject of the CIRM Resolution nº 001/1990. In 1997 it was reviewed and updated as the PNGC II that was approved by the CIRM Resolution nº 005/1997 for contemplating the experience of other Governmental institutions (as the MMA) and considering the provisions of the two main documents of UNCED: the Rio Declaration on Environment and Development and Agenda 21. The PNGC has as a primary aim the establishment of general rules for the environmental management of the Brazilian coastal zone, creating the basis for the formulation of state and local policies, plans and programs; and
- The Continental Shelf Survey Plan (LEPLAC), established by Federal Decree nº 98145/1989, has as its main purpose the establishment of the outer limits of the Brazilian extended continental shelf in its legal form.

[384] The representatives of the CIRM are from the Ministry of Defence; Ministry of Foreign Affairs; Ministry of Transportation; Ministry of Agriculture, Cattle and Supplying; Ministry of Education; Ministry of Developing, Industry and Foreign Trade; Ministry of Mines and Energy; Ministry of the Planning, Budget and Management; Ministry of Science and Technology; Ministry of Environment; and Ministry of Sport and Tourism.

[385] CIRM, Resolution nº 006, 2 December 1998. According the Brazilian National Programme of Action for Protection of the Marine Environment From Land-Based Activities in the Brazilian Section of the Upper Southwest Atlantic Region (MMA), the Port Environment Agenda is "responsible for suiting the port sector according to the country's current environmental standards by devising mechanisms to allow the monitoring and enforcement of environmental conservation regulation in all public ports and port facilities".

- To include port activities in the scope of coastal management;
- To implement units of environmental management in the administrative structure of the ports;
- To implement environmental management sectors in port facilities located out of organized port areas;
- To regulate the procedures of port operations, adjusting them to environmental standards; and
- To enable human resources for environmental port management.

Currently, the implementation of this agenda is still a challenge for all Brazilian ports due to many obstacles such as lack of financial resources and support or commitment from the port high administration. However, integrated initiatives have recently been undertaken by some of the Governmental institutions involved with port operations, universities and some port authorities to develop the idea. Considering the goals listed above and the aspects of the ballast water problem, the need for including it in the detail of Port Environmental Agenda is evident, since its effective implementation can help the BWM process and, on the other hand, the ballast water impacts can threaten the ports' environments and consequently the success of this program.

5.3.2 Ministry of Transportation (MT)

The Brazilian MT[386] Environmental Policy has as its principles the environmental feasibility of transportation projects, the need for environmental preservation, and the sustainable development of transportation.[387] Through its Environmental Policy, the MT recognizes that the construction and the operation of maritime ports and terminals have great potential to generate diverse environmental impacts. Regarding ballast water issues specifically, the MT's Environmental Politics identifies the control of alien species introduction as one of the necessary programs for the environmental control and recovery of Brazilian ports.[388] Moreover, the MT also recognizes that these programs must be established within the framework of environmental licensing of port projects and activities; and/or

[386] Brazilian Ministry of Transportation: http://www.transportes.gov.br/.
[387] MT, Política Ambiental do Ministério dos Transportes. November, 2003.
[388] *Ibid.*

established by the Port Authority in accordance with the local circumstances.[389] The MT also evaluates new proposals for norms and procedures for the security of the Maritime Authority (as a new NORMAM for instance) if such documents show repercussions on the economic and operational aspects of maritime transportation. This so as to ensure that the new measures would be economically feasible for the waterways transportation sector, without generating significant impacts on its operational dynamics.[390]

5.3.3 Special Secretariat of Ports (SEP)

In May of 2007, the responsibilities of the MT relating to maritime ports and dock companies were transferred to a new SEP[391] directly linked to the Presidency of the Republic. Therefore, the responsibility of directly assisting the President in the creation of a policy and guidelines for the development and promotion of maritime ports infrastructure now lies with SEP, while the same type of task concerning continental waterways remains under the mandate of MT. Regarding the environmental aspects associated to the ports, SEP must supply the MMA with information related to the projects and researches on the environmental impacts produced by the improvement of maritime port infrastructure.[392] Thus, it is expected that SEP will also participate in working groups and forums that are currently working on the development of BWM in the country.

5.3.4 National Agency for Waterway Transportation (ANTAQ)

ANTAQ[393] is the Brazilian federal agency responsible for regulating, supervising and inspecting the activities related to the rendering of waterway transportation services and the exploitation of port and waterway infrastructures. ANTAQ has in its organizational structure a specific Management of Environment (GMA). According to the ANTAQ's Internal Statute[394] the responsibilities of GMA include:

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[389] *Ibid*.
[390] Article 30, Brazilian Federal Decree nº 2596/1998, which regulates the Law nº 9537/1997.
[391] Created by the Provisional Measure nº 369/2007 that was converted into the Federal Law nº 11518/2007. SEP: http://www.portosdobrasil.gov.br/.
[392] Article 1 (1) (III), Annex I, Federal Decree nº 6116/2007.
[393] ANTAQ: http://www.antaq.gov.br/.
[394] Article 36, Annex, ANTAQ Resolution nº 646/2006.

- Follow the elaboration, the implementation, and the development of Environmental Management Plans in Brazilian ports;
- Follow the studies and international agreements regarding environmental management; and
- Subsidize and support the Port Authority Councils[395] with the monitoring of the port authorities' Environmental Management Plans.

Currently, ANTAQ has been playing a significant role in the process for discussing and developing all aspects of the environmental management of Brazilian ports. ANTAQ has also been fundamental for promoting better integration between all actors related with these issues, from Governmental, private, and academic sectors.

Regarding ballast water, in January 2006, ANTAQ organized and hosted a meeting to discuss the state-of-the-art approaches to BWM at that time. The meeting also discussed the implications of the requirements proposed in two federal bills that were being developed to regulate the inspections of ballast water in ships and the implementation of facilities in Brazilian ports for collecting and analyzing ballast water samples from ships. The meeting gathered representatives of the most diverse public and private institutions related to maritime transportation and port issues. As will be described in the following pages, a proposal of these two bills, as well as the idea of the reception and treatment facilities for ports, was violently criticized during the meeting and reject by practically all participants.

5.3.5 The Ministry of Environment (MMA)

The MMA[396] acts on diverse fronts to implement the objectives of the National Policy of the Environment (PNMA).[397] Thus, amongst its functions, the MMA has to consider and implement on a national level environmental, economic and social strategies and instruments that lead to the preservation, conservation and sustainable use of natural resources. These strategies and instruments could facilitate the healthful maintenance of the ecosystems and their biodiversity, as well as improve the environmental and life qualities for the Brazilian people.

[395] According Article 30 (XII), Brazilian Federal Law nº 8630/1993, the Port Authority Council (CAP) is responsible, *inter alia*, to ensure the compliment of the requirements for protecting the environment.
[396] Website of the MMA: http://www.mma.gov.br/.
[397] PNMA was established by the Brazilian Federal Law nº 6938/1981.

The MMA, through the Project for the Integrated Management of Coastal and Marine Environments (GERCOM),[398] is the Coordinating Agency for the GloBallast Programme in Brazil. For this purpose, the MMA is also assisted by a "National Task Force" composed of a multidisciplinary team of specialists and collaborators from several universities and institutions. The GERCOM is also responsible for coordinating the elaboration and implementation of the National Program of Port Environmental Quality (PQAPB)[399] that contemplate actions for integrating the port activity with planning instruments and territorial environmental management.

One of the PQAPB's subprograms has the objective of promoting the training of the port community with respect to principles of environmental management through a course called "Environmental Quality and Port Activity in Brazil". This course is part of the National Program of Port Environmental Train (PNCAP) and was adjusted to the Train-Sea-Coast[400] methodology through an agreement between MMA and Train-Sea-Coast Brazil, which is based in the Federal University of Rio Grande (FURG).[401] Its implementation has been conducted by MMA's Secretariat of Environmental Quality (SQA) and ANTAQ, and had already been provided in some Brazilian ports[402] and it includes, amongst other subjects,[403] BWM in ports.

The MMA also holds the Presidency of the National Environment Council (CONAMA), the consultative and deliberative body of the SISNAMA.[404] The CONAMA is a collegiate composed of representatives from the private sector and other areas of the civil society, as well

[398] More about the Project for the Integrated Management of Coastal and Marine Environments (GERCOM) is available on: http://www.mma.gov.br/index.php?ido=conteudo.monta&idEstrutura=78&idMenu=2720/.
[399] More about the National Program of Port Environmental Quality (PQAPB) is available on; http://www.mma.gov.br/index.php?ido=conteudo.monta&idEstrutura=78&idMenu=4699/.
[400] A Cooperative Training Programme in the Field of Coastal and Ocean Management. Website of the UN Train-Sea-Coast Programme: http://www.un.org/Depts/los/tsc_new/TSCindex.htm/.
[401] Website of FURG/Train-Sea-Coast: http://www.tsc.furg.br/.
[402] The PNCAP has already been applied for the port communities of: Port of Rio Grande, Port of Paranaguá, Port of Vitória, Port of Salvador, Port of Aratu, Port of Ilhéus, Port of Fortaleza, Port of São Francisco do Sul, Port of Itajaí, and Port of Imbituba.
[403] The course encompass the following subjects: Basis of Port Environmental Management, Geography of the Modern Port Activity, International Approaches on Port Environmental Management, Environmental Legislation on Ports, Geography of the Brazilian Port System, Atmospheric Emissions Management, Liquid Effluents Management, Solid Residues Management, Dredging Management, Ballast Water Management, and Risk Management.
[404] Established by the Brazilian Federal Law nº 6938/1981, that makes use of the National Politics of the Environment, regulated by the Federal Decree nº 99274/1990.

as of members of the federal, state and municipal agencies. Amongst other attributions, the CONAMA is responsible for:[405]

- Establishing norms and criteria for the environmental licensing of activities that can affect or potentially cause pollution;
- Establishing norms and national standards for the control of pollution caused by vessels and other transportation systems;
- Establishing systematic monitoring, evaluation and compliance of legal environmental requirements; and
- Regularly evaluate the implementation and execution of the National Environmental Policy through indicator systems.

Most of the national guidelines, criteria and standards related to environmental protection and the sustainable use of natural resources are established by CONAMA through specific resolutions. As outlined above, a CONAMA working group is currently working on the elaboration of a new resolution to regulate the introduction, reintroduction and translocation of alien species in aquatic environments.[406] Due to the fact that ballast water is an important issue in this regard, it is possible that this resolution will contain new requirements that affect BWM in Brazilian waters and/or ports. However, considering that many different vectors for aquatic bioinvasions exist, and that the same management methods cannot always be equally applicable for all of them, this should not be the only approach for BWM in the State.

Another limitation regarding non-specific norms is the possibility of their provisions conflicting with the current guidelines adopted through NORMAM-20 of the Maritime Authority, especially if the new requirements are also directed towards the management of ballast water in ships. On the other hand, in Brazil the IMO recommendations related to the characterization and the monitoring of the port environments are still far from the ideal. Thus, the idea of a new regulatory norm that could provide, in a more detailed way, these “port gaps” in BWM is highly anticipated. However, as it will be outlined in the following pages, the most opportune option currently would be the consideration and detailing of these recommendations in a CONAMA resolution destined to the regulation and standardization of the procedures and requirements for the environmental licensing of ports in Brazil.

[405] Article 8, Brazilian Federal Law n^{o} 6938/1981.
[406] Webpage of this CONAMA's working group: http://www.mma.gov.br/port/conama/ctgt/gt.cfm?cod_gt=126/.

In 2006 the MMA produced a National Notice on Invading Exotic Species,[407] with the objective of systematizing and disseminating the already existing information on the matter. The document is the first national diagnosis related to the distribution of these species and to the current capacity of the country to deal with the problem. Amongst its subprojects, two address the ballast water issue:

- The Notice on Invading Exotic Species that Threat the Marine Environment, which reports that at least 66 invading exotic species that affect the Brazilian marine environment were identified and divided into the following sub-groups: phytoplankton (3), macroseaweed (10), zooplankton (10), zoobentos (38), fish (4) and pelagic bacteria (1);[408] and
- The Notice on Invading Exotic Species that Threat the Continental Waters, reporting that at least 49 invading exotic species had been identified in such environments, involving crustaceans (1); aquatic macrophytes (6); microorganisms (1); mollusks (4); and fish (37).[409]

These numbers represent the total exotic species currently identified in both marine and fresh water environments, not only those introduced through ballast water. The results of this first diagnosis of biological invasions could allow MMA to delineate concrete measures for undertaking the priority actions necessary to prevent, control, and eradicate the invading alien species in the country and mitigate its impacts. Therefore, it is expected that for the period 2008 to 2011, the related actions would include inspections, monitoring and risk assessment.[410] Considering the importance of ports as hotspots for aquatic invasive species, it is obvious that the success of these actions depends also on its application in port areas.

5.3.6 The National Health Surveillance Agency

The National Health Surveillance Agency (ANVISA)[411] has as its mandate to foster the protection of the population's health by exercising sanitary control over production and marketing of products and services subject to sanitary surveillance. Regarding the waterways transportation, one of ANVISA's general attributions is to execute activities of epidemiologic surveillance and vector control in ports. Thus, only the vessels which present satisfactory

[407] Instituto do Meio Ambiente e dos Recursos Naturais Renováveis. Espécies Exóticas Invasoras: Situação Brasileira / Ministério do Meio Ambiente, Secretaria de Biodiversidade e Florestas. 24 pp. Brasília: MMA, 2006. More information available on: http://www.mma.gov.br/invasoras/.
[408] *Ibid*. p. 12.
[409] *Ibid*. p. 13.
[410] According MMA, available on: http://www.mma.gov.br/invasoras/ accessed 23 August 2007.
[411] ANVISA: http://www.anvisa.gov.br/eng/index.htm/.

standards of hygiene and fulfill all the correct and appropriate sanitary and health requirements will receive the Certificate of Free Practice which allows them to sail into Brazilian territorial waters.[412] As will be further elaborated upon bellow, ANVISA has established its own version of BWRF as one of the necessary documents for the allowance of the Certificate of Free Practice.[413]

Therefore, nowadays, agents of ANVISA and the Maritime Authority are responsible for performing inspections on ships that arrive in ports so as to verify if the ballast water quality meets the requirements of Resolution RDC n^{o} 217/2001 and the NORMAN-20.

5.3.7 Brazilian Institute for the Environment and Natural Renewable Resources

IBAMA[414] is one of the federal agencies associated to the MMA[415] and corresponds to the executive agency of the National Environment System (SISNAMA), with the mandate of executing the national policy and Governmental guidelines for the environment as well as

[412] According Article 1 (XXXII), Annex, Resolution RDC n^{o} 217/2001, "Free Practice" means the authorization given by the competent federal health surveillance agency (currently ANVISA) necessary for a vessel, originating from foreign ports or not, to berth or to begin loading or unloading operations of cargo and passengers. It could be:

- "On Board Free Practice" which is issued on board after sanitary inspection; or
- "By Radio Free Practice" which is issued after satisfactory evaluation of the information given on the request for the Certificate of Free Practice, without an on board sanitary inspection, at the moment of its emission.

Article 7 of the same resolution states that the Certificate of Free Practice is a document which is not transferable, given after the analysis of the operational and sanitary conditions of the vessel and the health conditions of its travelers.

[413] Articles 25 and 26, Annex, Resolution RDC n^{o} 217/2001.

[414] IBAMA was created by the Federal Law n^{o} 7735/1989, which unified four other federal institutions related to environmental issues: the Secretariat of Environment (SEMA), Superintendence of Rubber (SUDHEVEA), Superintendence of Fisheries (SUDEPE), and the Brazilian Institute of Forestry Development (IBDF). According Article 2 of this Law, IBAMA is responsible for:

- Exercise the power of environmental police;
- Perform actions of the PNMA referring to federal assignments on the environmental licensing, the environmental quality control, the authorization of use of natural resources, and environmental inspections, monitoring, and control, in accordance to the guidelines issued by the MMA; and
- Perform supplementary actions of federal competence, according the currently environmental legislation.

IBAMA: http://www.ibama.gov.br/.

[415] This linkage between IBAMA and MMA is not of dependence and/or submissive character, despite the strong political influence that the Ministry of Environment exercises upon the agency. The other institutions with similar relations to MMA are: the Chico Mendes Institute of Biodiversity Conservation (ICMBio), the Rio de Janeiro Botanic Garden Research Institute (JBRJ), the National Water Agency (ANA), and the Barcarena Development Company (CODEBAR).

enforcing compliance with the same guidelines and policy.[416] In this sense, one of IBAMA's main aims is to execute regional and national environmental control and inspections. The IBAMA is also responsible for leading the federal environmental licensing of enterprises and activities with significant nationwide or regional environmental impacts.[417] The IBAMA currently leads the processes of environmental regularization of some of the most important ports in Brazil, such as Santos, Paranaguá, Salvador, Aratu, São Francisco do Sul and Rio Grande.

In December 2005, the IBAMA's Directorate of Environmental Licensing promoted a workshop on ballast water.[418] The objective of this meeting was to bring together technicians and researchers to discuss and define which procedures related to the management of the ballast water could be applied to the process of environmental licensing of ports. One of the final proposals elaborated through this workshop was the adoption of a Port Plan for Ballast Water Management as one of the environmental plans and programs usually required by agencies in the scope of the environmental license of ports. The workshop was only the beginning of the debate. In the end, the participants pointed out the need for more meetings with representatives of other public and private institutions involved with the issue in order to reach a more defined and accurate conclusion as well as to discuss other pertinent matters. However, this proposal has not yet materialized and the lack of standards for requirements and criteria used by the environmental agencies during the processes of environmental licensing of ports still exists.

5.3.8 State Environment Agencies

Other institutions that could be important in improving the BWM in Brazil are the state environment agencies[419] which, in the scope of the SISNAMA, are also responsible for the execution of programs, projects and for the control and inspection of activities capable of causing the degradation of the environment.[420] In general, the state environment agencies are responsible for leading the environmental licensing of enterprises and activities whose direct

[416] Article 6 (IV), Brazilian Federal Law nº 6938/1981.
[417] Article 4, CONAMA Resolution nº 237/1997.
[418] Internal Workshop on Ballast Water, 13 and 14 December 2005, National Center of Development and Training of Human Resources (CENTRE), IBAMA.
[419] Brazilian Association of State Entities of Environment (ABEMA): http://www.abema.org.br/.
[420] Article 6 (V), Brazilian Federal Law nº 6938/1981.

environmental impacts exceed the territorial limits of one or more cities but are restricted to the limits of the respective states.

As demonstrated in this Section, many are the institutions responsible for regulating and promoting activities related to port operations and shipping, each of which with specific mandates, but in some cases also presenting similar tasks. As commented, some projects and actions regarding aspects of invasive alien species and BWM are already under development by some of these institutions. However, the effectiveness of these initiatives can be in jeopardy if they do not evolve through inter-institutional dialogue and integration. As outlined in the previous chapters, this integration is crucial to the development of a national program for BWM and its accomplishment through a permanent technical forum on the subject. For instance, as a task force in the form of the U.S. ANSTF may be an interesting strategy to be adopted in Brazil.

In the following Section the development and adoption of the current legal instruments governing some of the aspects of BWM in Brazil are detailed, as well as the performance of the institutions that have adopted such instruments and the effectiveness of their measures in achieve the goals. In the latter case, the evaluation of such effectiveness is based on the results of studies that have been undertaken in some of the Brazilian ports.

5.4 National Legislation (Internalization of the BWM Convention)

Before addressing the specific legal regime that internalized some of the provisions of the BWM Convention in Brazil, it is important to underline that it is a constitutional right for all Brazilians the ecologically balanced environment.[421] Moreover, such environments are considered to be a possession of common use of the people and are essential to a healthy life; and it is the people's duty to demand that the Government and the community in general defend that right for present and future generations.[422] The Federal Constitution also considers the coastal zone as a part of the national patrimony, and shall be used under conditions which guarantee the preservation of the environment.[423] Finally, the Federal Constitution determines that the procedures and activities considered as harmful to the environment shall subject the

[421] Article 225 (Chapter VI – Environment), Federal Constitution of Brazil, 1988.
[422] *Ibid*.
[423] Article 225 (4) (Chapter VI – Environment), Federal Constitution of Brazil, 1988.

offenders, be they individuals or legal entities, to penal and administrative sanctions, as well as the obligation to repair the damages caused.[424] Thus, the use of the ballast water, as well as any other type of port and shipping operational activities, must be undertaken in absolute compliance with such principles.

5.4.1 Law of Environmental Crimes

The applicable penalties for harmful activities[425] to the environment are prescribed by the Law of Environmental Crimes.[426] This law, in compliance with what the Federal Constitution states, provides detailed and specific criminal liability to the agents that pollute or degrade the environment in any form of action. This criminal liability is extended to any member representing official entities that do not prevent criminal actions due to absence or omission of their legal responsibilities.[427] Thus, considering the consequences of the introduction of alien species and/or pathogenic agents in port environments, and the specific legislation for BWM, there is no doubt that the improper discharge of ballast water constitutes an environmental crime and its practice can be punished in accordance with the provisions of this law.[428] In fact,

[424] Article 225 (3) (Chapter VI – Environment), Federal Constitution of Brazil, 1988.

[425] There is no specific definition for the term "harmful activities." However, Article 1 of the Federal Decree nº 3179/1999 that regulates the Federal Law nº 9605/1998 states that any action or omission that violates the juridical rules of use, enjoyment, promotion, protection and recovery of the environment is considered an environmental administrative infringement and will be punished with sanctions of this law, without prejudice to the application of other penalties prescribed in any legislation.

[426] Brazilian Federal Law nº 9605/1998, regulated by the Federal Decree nº 3179/1999.

[427] Article 2, Brazilian Federal Law nº 9605/1998.

[428] The following articles of the Law of Environmental Crimes can address more directly the environmental impacts that can be caused by ballast water discharges and also to the improper conduct of official agents responsible for promoting the control and inspections:

- Article 33: Cause, by effluents emissions […], the death of specimens of the aquatic fauna existing in rivers, lakes, dams, bays or Brazilian jurisdictional waters: Penalty - arrest of one to three years, or fine (from five thousand to one million reais (R$) – Article 18 of the Federal Decree nº 3179/1999), or both cumulatively. […]

- Article 54 (mainly paragraph 2 – III, IV, V; paragraph 3): Cause any kind of pollution at such levels that result or may result in damage to human health, or cause the killing of animals or significant destruction of flora: Penalty – imprisonment of one to four years and fine (from one thousand to fifty million reais or daily fine – Article 41 of the Federal Decree nº 3179/1999). Paragraph 1 - If the crime is conducted voluntary, with no intention to produce the illicit result, but predictable, which could be avoided: Penalty – detention of six months to one year and fine. Paragraph 2 - If the crime: […] III - cause water pollution that makes necessary the interruption of public water supply of a community; IV – cause difficulty or impede the public use of beaches; V - occur due to release of solid, liquid, or gaseous waste or debris, oil or oily substances, in disagreement with the requirements of laws or regulations: Penalty - imprisonment of one to five years. Paragraph 3 – Is subjected to the same penalties contained in the previous paragraph who do not adopt, when required by competent authority, the precautionary measures in case of risk of serious or irreversible environmental damage.

according the Section 4.3 of the Introduction of NORMAM-20, the rules that govern the penalties for the non compliance with its preventive requirements are based on Article 61 of the Federal Decree n^{o} 3179/1999 and Article 70 of the Law of Environmental Crimes.

5.4.2 NORMAM-08

NORMAM-08 was the first national measure adopted in 2000 to obtain information on ballast water discharged in Brazilian ports.[429] This legislation codifies the compulsory use of BWRF[430] (Annex 03), which corresponds to Recommendation 8.1.3 of IMO Resolution A.868(20).[431] Through the BWRF, the Brazilian Maritime Authority requested information on

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- Article 61: To spread disease, pest, or species that may cause damage to agriculture, livestock, fauna, flora, or ecosystems: Penalty - imprisonment of one to four years and fine (from five thousand to two million reais – Article 45 of the Federal Decree n^{o} 3179/1999)
- Article 66: Make the public servant false or misleading statement, omit the truth, withhold information or technical-scientific data during procedures of authorization or environmental licensing: Penalty - imprisonment (reclusion) of one to three years and fine.
- Article 68: Not do, who have the legal or contractual obligation to do so, to accomplish obligation of relevant environmental interest: Penalty – detention of one to three years and fine. Single Paragraph. If the crime is conducted voluntary, with no intention to produce the illicit result, but predictable, which could be avoided: the penalty is three months to one year, and fine.
- Article 69: Obstruct or cause difficulty to action of inspection of the Government in dealing with environmental issues: Penalty - detention of one to three years and fine.
- Article 69-A: Elaborate or present, for licensing, forest concession or any other administrative procedure, an environmental study, finding or report fully or partially false or misleading, even by omission: Penalty - imprisonment of three to six years and fine. Paragraph 1 - If the crime is conducted voluntary, with no intention to produce the illicit result, but predictable, which could be avoided: Penalty - detention of one to three years. Paragraph 2 - The penalty is increased to 1/3 to 2/3 if there is significant damage to the environment as a result of the use of false information, incomplete or misleading.
- Article 70: Environmental administrative infringement is any action or omission that violates the legal rules of use, enjoyment, promotion, protection and recovery of the environment. Paragraph 1 – the competent authorities for issue a "environmental infraction notice" and initiate an administrative process are the official functionaries of environmental agencies part of SISNAMA designated for inspection activities, and the agents of Captains of Ports […] Paragraph 3 - the environmental authority who has knowledge of environmental infringement is required to promote its immediate inquiry through the specific administrative process, under penalty of co-responsibility.

[429] NORMAM-08 - Norms of the Maritime Authority for Traffic and Permanence of Vessels in Brazilian Territorial Waters, approved by the Edict n^{o} 106/DPC, of December 16, 2003.

[430] Norm 0307 - Ballast Water Reporting Form (BWRF), on Section III - Inspection by National Authorities of the Chapter 3 - Permanence in Brazilian Territorial Waters. Annex 3-A of NORMAM-8. The BWRF should have filled in two copies, keeping one on board for eventual inspections and another one should be collected by the competent Federal Agency.

[431] Recommendation 8.1.3, IMO's Resolution A.868(20), November 27, 1997: "When taking on or discharging ballast water, as a minimum, the dates, geographical locations, ship's tank(s) and cargo holds, ballast water

quality, amount, origin and places of discharge of ballast water in Brazil. However, as will be outlined in the following pages, it seems that at that time this first BWRF requirement did not receive proper consideration by the actors involved and did not work as an effective measure of control.

5.4.3 Law of Oil

Also in 2000, the potential environmental harm caused by ballast water containing oil and other harmful or dangerous substances was legislated in accordance with MARPOL provisions through the Law of Oil.[432] Thus, clean ballast was legally defined in Brazil only as ballast water contained in a tank that, if discharged by a stopped ship in clean calm waters on a clear day, would not produce visible oil traces on the surface of the water or on the adjacent coast. Moreover, it would also not produce dregs or emulsions under the surface of the water or on the adjacent coast.[433] Although this law identifies harmful or dangerous substances,[434] as MARPOL Convention it does so generally and does not specifically address the risks of introduction of alien species or pathogenic agents. Therefore, assuming that the Federal Law nº 9966/2000 does not address to the provisions of the BWM Convention, but that alien species or pathogenic agents can cause environmental impacts with similar effects of those included in its definition for harmful and dangerous substances, the latter can be considered through the interpretation of the law.

5.4.4 RDC no 217/2001

As outlined above, in 2001, the ANVISA also adopted some of the recommendations of IMO Resolution A.868 (20) through its Resolution RDC nº 217/2001. Similar to NORMAM-08, one of the measures adopted by ANVISA for requesting information on ballast water[435]

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temperature and salinity as well as the amount of ballast water loaded or discharged should be recorded. [...] The record should be made available to the port State authority."

[432] Brazilian Federal Law nº 9966/2000, which governs the prevention, the control and the inspection of the pollution caused by the launching of oil and other harmful or dangerous substances in waters under national jurisdiction. Latter, the applicable sanctions and penalties to the infractions committed against the requirements of this law were implemented by the Federal Decree nº 4136/2002.

[433] Article 2(XVII), Brazilian Federal Law nº 9966/2000.

[434] According Article 2(X), Brazilian Federal Law nº 9966/2000, harmful or dangerous substances can be any substance that, if discharged in waters, is capable of generating risks or causing damages to human health, the aquatic ecosystem or to harm the use of water and its surrounding area.

[435] Articles 2(X), and 26, Resolution RDC nº 217/2001.

was the BWRF (Annex 04). This time, however, the information was required as a condition for the vessels to receive the Certificate of Free Practice.[436] Regarding this, before the vessels enter Brazilian ports, the person directly responsible for them shall provide data regarding the storage of ballast water on board and its discharging in waters under national jurisdiction.[437] Moreover, if the ballast water is collected from a geographic area considered as a risk area to public health or to the environment, the concession of the Certificate of Free Practice also depends on sanitary inspections.[438] Furthermore, the unballast operation depends on a previous authorization from the sanitary authority and must be done with relevant preventive and control measures.[439] Finally, at the discretion of the sanitary authority, any vessel is subject to the collection of a sample of the ballast water for the purpose of identifying the presence of harmful and pathogenic agents, physical indicators, and chemical components.[440] Therefore, considering the lack of integration between the Governmental authorities, at that time vessels that intended to enter into Brazilian ports started being requested to provide two different models of BWRF, one to ANVISA and the other to Maritime Authority.[441]

5.4.5 NORMAM-20

On 15 October 2005, the Norm of the Maritime Authority for the Management of the Ballast Water of Ships (NORMAM-20) started to have effect in Brazil.[442] Through this norm, the Directorate of Ports and Coasts (DPC) of the Brazilian Maritime Authority implemented some requirements on national waters of the new BWMC. The use of a norm instead of a federal law was chosen because the processes of creating and updating a federal law has many steps and requires a very long period to be concluded. On the other hand, a norm allows more

[436] According to Article 1(XXXII), Technical Regulation Annex, Resolution RDC nº 217/2001, Free Practice is the authorization to be issued by the competent Federal Sanitary Surveillance Body enabling a vessel originating or not from abroad to board or to start cargo or passengers' boarding or unboarding operations; it may include: a) Free Practice on Board: that to be issued on board, after the sanitary inspection; b) Free Practice by Radio: that to be issued from the satisfactory evaluation of the information submitted with the Certificate Request, without a sanitary inspection on board, at the time of its issuance.
[437] Article 25, Resolution RDC nº 217/2001.
[438] Article 19, Resolution RDC nº 217/2001.
[439] Article 27, Resolution RDC nº 217/2001.
[440] Article 28, Resolution RDC nº 217/2001.
[441] See annexes 3 (BWRF adopted by NORMAM-08/2000) and 4 (BWRF adopted by Resolution RDC nº 217/2001).
[442] Divulged by the Edict nº 52/DPC, 14 June 2005. This Edict also cancelled Annex 3-A of NORMAM-8. The Ballast Water Reporting Form started to correspond to Annex A (in Portuguese) and Annex B (in English) of the NORMAM-20.

flexibility to make revisions and updates in its requirements if more advanced methods for ballast water treatment are developed.

The NORMAM-20 established that all national or foreign ships equipped with ballast water tanks and/or bilges that enter in Brazilian territorial waters must possess a specific Ballast Water Management Plan.[443] The intention of this plan is to supply safe and efficient procedures to handle ballast water. Moreover, NORMAM-20 specifies that the plan must be included in the operational documentation of the ship and has to be approved by a ship classification society.[444] Also, the BWRF is now a requirement of NORMAM-20 **(**Annex 05**)** and has to be duly completed and sent to the appropriate agencies by the ships' commanders, or its agents, at least 24 hours before the arrival of the vessel.[445]

Nevertheless, BWM established by NORMAM-20 prescribes ballast water exchange as its central measure in accordance with the recommendations of IMO Resolution A.868 (20)[446] and BWMC.[447] Thus, before vessels arrive in Brazilian ports, they have to exchange at least 95% of their ballast water at a minimum distance of 200 nm from the coast, in waters that are at least 200 meters deep.[448] In order to properly execute this procedure, vessels can use the following methods: the sequential method, the flow-through method or the dilution method.[449] In case the weather and/or sea conditions prevent the equipment from functioning properly or create unsafe conditions for the vessel, cargo and/or crew, the procedure may take place closer to the coast, but no less than 50 nm and in waters of at least 200 meters deep.[450]

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[443] Chapter 2, Section 2.2 (Ballast Water Management Plan), NORMAM-20.
[444] Chapter 2, Section 2.2.2, NORMAM-20.
[445] According to Chapter 2, Section 2.3.2, NORMAM-20, the Ballast Water Reporting Form has to be sent to Captains of Ports (Capitanias dos Portos - CP), or their Offices (Delegacias - DL) or Agencies (Agências - AG); and in case the ships go to Amazon Basin, a copy of the form has also to be sent to the Office of the Captain of Ports in the city of Santana, independently of its destination in that region.
[446] Section 9.2.1, IMO Resolution A.868 (20).
[447] Regulation B-4, BWMC.
[448] Chapter 2, Section 2.3.3, NORMAM-20.
[449] Annex C, NORMAM-20. The methods are described by Resolution MEPC.149(55) 13 October 2006 as: Sequential Method means a process by which a ballast tank intended for the carriage of ballast water is first emptied and then re-filled with replacement ballast water to achieve at least a 95 per cent volumetric exchange; Flow-through Method means a process by which the replacement ballast water is pumped into a ballast tank intended for the carriage of ballast water, allowing water to flow through overflow or other arrangements; and Dilution Method means a process by which replacement ballast water is filled through the top of the ballast tank intended for the carriage of ballast water with simultaneous discharge from the bottom at the same flow rate and maintaining a constant level in the tank throughout the ballast exchange system.
[450] Chapter 2, Section 2.3.3 (b), NORMAM-20.

Taking in consideration the unique natural characteristics of the Brazilian Amazon, the norm also established some specific criteria for ships that wish to enter into this region. In this case, ships on international voyages, or from a different hydrographical basin, are required to undertake two ballast water exchanges.[451] The first one is to prevent the transfer of alien species and/or pathogenic organisms and needs to be carried out as described in the previous paragraph. This exchange affects ships that perform international voyages as well as those in cabotage, and it has to reach at least the amount corresponding to the total capacity of the ballast tank. The purpose of the second exchange is to reduce the salinity of the ballast water in order not to cause a significant saline impact during the unballast of sea water into the destination port area. This second exchange must be done in specific areas, different for the Amazon and Pará rivers,[452] and it is only necessary to pump the tank volume once for both the international and cabotage voyages.

Following the IMO recommendations, NORMAM-20 establishes that the procedures for the management of ballast water and its sediments must be efficient, safe and environmentally feasible.[453] Moreover, the application of such procedures cannot offer risks to the security of the vessel, to its crew or cargo, and to navigation; nor can it produce unnecessary costs and delays for the voyage and the shipment.[454] Thus, a vessel will not be demanded to deviate from its planed route in order to fulfill with the requirements related to the ballast water exchange.

The prerequisite that the ballast water exchange may not cause unnecessary costs or delays for the voyage and the shipment, in addition to all other obstacles previously outlined, limits even more its effective implementation by all vessels. Both NORMAN-20 and the BWMC leave up to the shipping industry the interpretation of what would be “unnecessary costs” and it counts against the force of the ballast water exchange as a Governmental measure for managing and/or controlling ballast water discharges. Considering the proper definition of ballast water management provided by NORMAM-20, it seems that the current applicability

[451] Chapter 3, Section 3.4 (Two ballast water exchanges), NORMAM-20.
[452] Chapter 3, Sections 3.4.1 and 3.4.2, NORMAM-20: For the Amazon River, the second exchange have to take place between the 20 metres isobaric and the city of Macapá. If ships have a volume of ballast water lesser or equal to 5,000 cubic metres, the limit will be the mouth of Jari River. For the Pará River, the second exchange must occur at least 60 nm from Salinópolis city until the lighthouse of the Ponta do Chapéu Virado (Mosqueiro Island).
[453] Chapter 1, Section 1.1, NORMAM-20.
[454] *Ibid.*

of this measure cannot totally "remove, make harmless, or avoid uptake or discharge of harmful aquatic organisms and pathogenic agents found in the ballast water and sediments" of all ships.[455]

Due to their special needs and high sensitivity to environmental conditions during the first stages of life (larval period), a great part of organisms present in ballast waters die during the voyage or during the ballast and unballast operations.[456] Furthermore, it is estimated that, when correctly applied, the oceanic ballast water exchange can reduce the concentration of living coastal organisms by an average of 90%.[457] However, since many species have efficient strategies to survive under adverse environmental conditions such as cysts or resting spores sheltered in the accumulated sediments in the bottom of ballast tanks, the discharge of the remaining 5% of unchanged ballast water, even diluted due to the exchange, can be enough to cause significant transfers of organisms.

Another weakness of BWM strategies that have only ballast water exchange as their principal measure for preventing the introductions is the fact that the salinity, one of the important stress factors for aquatic organisms, and also the parameter often measured during naval inspections, may not have the expected effect of stress or guarantee compliance with the exchange requirement since many coastal ports can be perennially or seasonally located close to waters of similar salinity with open ocean waters. In this case, when ships have ballast water of high salinity inside their ballast tanks, the exchange could cause the dilution of the ballast water and its coastal organisms but not cause a saline stress. Moreover, in offshore ports or ports located in bays with low fresh water input, during the high tide, ships can fill their ballast tanks with salinity of 35 without necessarily performing oceanic exchange.

The chances of a new and dangerous introduction of alien species or pathogenic agents can increase even more if the BWM system adopted does not work exactly as the agencies had

[455] NORMAM-20, Section 5 - Definitions, ballast water management: it includes the mechanical, physical, chemical, and biological processes, either individually or combined, for removing, making harmless or aroid the admission or discharge of aquatic harmful organisms and pathogenic agents found in ballast water and sediments, when applied. Includes both the ballast water exchange in ocean waters and water treatment.
[456] Ministério do Meio Ambiente and Train-Sea-Coast Brasil. Gerenciamento de Água de Lastro, *op cit*. p. 7.
[457] Gregory M. Ruiz and David F. Reid, Current State of Understanding About the Effectiveness of Ballast Water Exchange (BWE) in Reducing Aquatic Nonindigenous Species (ANS) Introductions to the Great Lakes Basin and Chesapeake Bay, USA: Synthesis and Analysis of Existing Information. NOAA Technical Memorandum GLERL-142, 127 p. September 2007; Mark S. Minton *et al*, Reducing propagule supply and coastal invasions via ships: effects of emerging strategies. Front. Ecol. Environ., p. 304–308, 2005.

intended, e.g. the enforcement of compliance is not performed. With respect to ballast water exchange in Brazil, the following studies have found that most ships perform ballast water exchange incorrectly or do not perform it at all.

5.5 Enforcement and compliance

One of the first studies is the one refered to above which was undertaken by ANVISA in 2002. Through the analysis of ballast water salinity, the study indicated that about 62% of the ships in Brazil were not performing deep-sea ballast water exchanges in compliance with IMO guidelines.[458]

Another study analyzed BWRFs for the port of Itajaí, located in the state of Santa Catarina, South of Brazil.[459] This study confirmed that, of 808 BWRFs presented in 2003, only 270 (33.42%) stated that oceanic ballast water exchange had been performed. Fifty BWRFs were randomly chosen from the 270 that had undertaken the exchange and it was found that more than 45% of the listed geographic coordinates indicated that the exchange had been made in places that did not follow the IMO recommendations.[460] The geographic coordinates corresponded to places near the coast or islands, inside bays and coves, and, in one of the BWRFs, it corresponded to a place on land located approximately 450 km far from the coast.

The same study also verified that, of the total of 808 BWRFs presented in 2003, only 39 (4.83%) had declared to have made unballast operations. Of these 39 reports, 11 declared not to have done the oceanic exchange, 9 did not provide information about the original source of the ballast water but only the geographic coordinates of the beginning and the end of the oceanic exchange operation, and 1 did not provide information on the source of the ballast water, nor the geographic coordinates of the oceanic exchange. The port of Itajaí is mainly an exporting port (primarily for containers) and, in accordance with the study, at least 70% of the reports are expected to declare some unballast operation of any volume of ballast water. The study estimated that 761.048m³ was the total volume of ballast water theoretically discharged

[458] ANVISA, Brazil Ballast Water, *op cit*. p. 4.
[459] Altevir Caron Junior, Avaliação do Risco de Introdução de Espécies Exóticas no Porto de Itajaí e Entorno por Meio de Água de Lastro. Masters Dissertation on Environmental Science and Technology. Curso de Pós-Graduação Stricto Sensu em Ciência e Tecnologia Ambiental, centro de Ciências Tecnológicas da Terra e do Mar, Universidade do Vale do Itajaí. Orientador: Dr. Luís A. de Oliveira Proença. Itajaí, 2007.
[460] At that time the exchange was just voluntary as recommended by Resolution A.868(20).

in 2003 in the port of Itajaí. However, the total volume declared through the BWRFs was only 56.169m³, just 7.38% of the total amount anticipated, and clearly well below the amount expected given the load movement in that year for that port.

A study undertaken during 2002 for the GloBallast Programme[461] on ballast water risk assessment for the Port of Sepetiba also found similar results.[462] The study found that of the 919 BWRFs acquired between 1998 and 2002, 40% could not be used for their purpose due to serious information gaps. Moreover, in order to make use of most of the remaining 60% of the BWRFs, a considerable amount of work was necessary so as to recover the information including making corrections, filling in gaps and making estimates. The study also reported that, even after the establishment of the BWRF as a condition for ships receiving Certificates Free Practice, the lack of information as well as the presence of incorrect data was still occurring. The most common omissions or mistakes submitted were:

- Ballast water uptake date, source port/location and/or discharge volume provided for none, one, or only a few of the total number of tanks considered most likely to have been discharged;
- No exchange data in the ballast water exchange field, or no reason given for not undertaking an exchange;
- BWRFs showing ballast water exchange data contained empty ballast water source cells;
- Different and confusing combinations of ballast tanks listed in the ballast water source and ballast water discharge columns of the BWRF; and
- Ballast water discharge field often ignored or partially filled, even by ships loading a full cargo and therefore discharging most of their ballast.

Another report of the same study for the GloBallast Programme indentified several other lacunas:[463]

- The use of different units, sometimes the lack of information about the unit used;
- No arrival date;
- No name nor rank of the responsible officer;

[461] Chris Clarke *et al*, Ballast Water Risk Assessment, Port of Sepetiba, Federal Republic of Brazil. GloBallast Monograph Series nº 14. Final Report, December 2003.
[462] The port is currently called "Port of Itaguaí." The name of the port was changed to relate it to the name of the town (Itaguaí) instead of the name of the bay (Sepetiba) where it is located. Brazilian Federal Law nº 11200/2005.
[463] Andréa de Oliveira Ribeiro Junqueira and Alexandre de Carvalho Leal Neto. Avaliação de Risco de Água de Lastro. In: IV Seminário sobre Meio Ambiente - Sobena, Rio de Janeiro. v. 1, p. 1-7, 2003.

- Different combinations of tanks in the "source" and in the "discharge" of ballast water;
- Incoherent data (number of tanks and/or volumes) between different sections of the BWRFs;
- Confusion in the "Sea height (m)" field between the depth where the exchange happened and The wave height;
- Incomprehensible writing;
- Different types of forms; and
- Unreadable copies.

Another large study for the port of Paranaguá (state of Paraná) found the same standard of imperfections regarding the information given by ships through the BWRFs during the period 2003 to 2004.[464] At the time covered by the BWRF used by these first studies it was required by NORMAM-08 and by the Resolution RDC n^{o} 217/2001, and both legal documents did not foresee specific civil nor criminal penalties for the non-compliance of their provisions. In fact, as was previously mentioned, the single predictable consequence for ships was the possibility of not receiving the Certificate of Free Practice. However, it seems that even such consequence was not a concern for the shipping industry, since the quality of the information recorded on the BWRF at the time of these studies indicates that the BWRF were completed merely as a means to receive the Certificate of Free Practice and that compliance was seriously lacking. In fact, proper importance and attention were not given by the person in charge of completing the information clearly and accurately on the BWRF, nor was due diligence exercised by the public agent responsible for checking such information when receiving the document.

Currently, at least two other studies have been undertaken for the ports of Rio de Janeiro (state of Rio de Janeiro) and the ports of the Amazon region. Initial observations indicate that more recently the BWRFs from the port of Rio de Janeiro are more complete, although they still present many mistakes. More mistakes and gaps are found in the BWRF from the ports of Amazon region, since for these ports two ballast water exchanges are required and must be reported in two distinct BWRFs. Considering the regional and even global ecological importance of the Amazon region, whose hydrological basins cover a vast territory that

[464] Plano de Manejo de Espécies Exóticas em Água de Lastro de Navios no Porto de Paranaguá, Paraná - Projeto ALARME. Convênio n^{o} 008/2002 FNMA-MMA. Not published yet.

extends through several States,[465] and bearing in mind the expected development in the waterways and ports located there, such mistakes could represent a huge risk and the environmental impacts and consequent losses would be incalculable.

Therefore, it seems clear that the stricter requirement for ships calling into Amazon ports to perform two ballast water exchanges should be accompanied by a more intensive inspection activity that could cover no less than 100% of the vessels. In this way, similar compliance and effectiveness of the ballast water exchange with those obtained by U.S. and Canada authorities for the Great Lakes St. Lawrence Seaway System could be expected.

Currently, BWRF reporting is part of NORMAM-20's requirements, which already specifies penalties for those who do not comply with them.[466] In Brazil, the inspections for verifying the compliance with NORMAM-20 by national and foreign vessels berthed or anchored in major Brazilian ports and terminals is currently being undertaken by approximately 55 naval inspectors. These inspectors are distributed in 59 Military Organizations (OM) of the Brazilian Navy (23 Captains of Ports, 16 Offices, and 20 Agencies), involved exclusively and permanently with the safety of the waterway traffic. The inspections are conducted under the supervision of DPC, through its Management of Inspections and Technical Investigation (GEVI).

Between 1 January and 30 September 2006, 1,385 vessels were inspected for compliance with diverse aspects related to the safety of navigation, safety of human life, and the prevention of water pollution.[467] During these inspections it was found that deficiencies related to BWM were some of the most frequent violations. This represents an average of approximately 154 vessels inspected per month, which results in a total of 1846 in that year if the same effort of inspection was applied in the last three months of that year. As noted above, in 2006 the commercial navigation in Brazil was composed of at least 17,966 ships engaged in international trade, 4,639 ships in national cabotage, and 9,393 ships in other types of sailing. Considering just the international voyages and cabotage, the estimated total of 1846

[465] Just the basin of the Amazon River would cover 6,112,999 km^2 and reach 7 States: Brazil (63%), Peru (16%) Bolivia (12%) Colombia (5.6%) Equador (12.3%) Venezuela (0.8%) and Guyana (0.39%). Michael Molinier *et al*, Hidrologia da Bacia do Rio Amazonas. Ciência e Tecnologia. p. 31-36, 1995.

[466] The penalties are prescribed by the Brazilian Federal Law n^o 9605/1998, the Law of Environmental Crimes.

[467] Edgar Nilton de Rezende Barbosa, Informativo Marítimo Jan-Marc 2007. Diretoria de Portos e Costas. Available on: https://www.dpc.mar.mil/informativo/jan_mar07/not_comunidade/not_comunidade.htm/ accessed 5 January 2007.

inspections represented just 8.16% of the principal commercial vessels that used Brazilian ports in 2006.

Regarding BWM, the following points were observed during naval inspection onboard ships:

- Compliance with the open sea exchange;
- Existence of completed BWRFs; and
- Existence of ballast water management plans duly approved by a Classification Society or Maritime Authority from the flag State.

According to personal communications, the main non-compliance with NORMAM-20 by foreign vessels was the absence of an approved ballast water management plan. In practice, in this case, the vessel receives a "notice" that determines that it cannot return to operate in Brazil until the violation has been remedied. In case the vessel sails under a Brazilian flag, the penalty corresponds to a fine. In the Amazon River basin, it was reported that several ships have been already arraigned or obligated to leave the port in order to perform the second ballast water exchange. However, considering the small percentage of ships inspected and that probably not all inspections verified BWM compliance, the risks related to ballast water discharges is still high.

Despite the fact that representatives of many institutions related to shipping and port activities believe that improvements are occurring, especially in the quality of the information submitted by vessels on the BWRFs, they happen very slowly and there are still doubts if the currently status of the Brazilian BWM system would represent any significant benefit and safety to port environments. In any case, it is clear that there is a need for a larger number of inspectors, better conditions of work, and the implementation of an updated and constant qualitative analysis of BWRFs. It is only with the prior evaluation of the BWRF that the prevention of ballast water discharges that do not meet the current standards can be ensured.

Currently, the BWRFs are only received and filed, not analyzed. Their analysis is not undertaken as a regular, but only through isolated initiatives, mainly undertaken during academic research with no updated results. The lack of compliance with the law is mainly due to limitations that the Maritime and Sanitary Authorities responsible for receiving the reports

and undertaking the inspections on ships face on a daily basis. These limitations are primarily related to insufficient technical and personnel resources which prevent these authorities from acting in an efficient manner to correct the problem.

Considering the competence of both the Maritime Authority and ANVISA, another problem that persists regarding the BWRF is the requirement to complete two different forms: one prescribed by NORMAM-20 and another by Resolution RDC n^{o} 217/2001. The Maritime Authority and ANVISA had an agreement that the BWRF of NORMAM-20 would be enough to satisfy the requests of both entities.[468] Thus, the ship can fulfill just one form and its maritime agent can make copies to hand to the necessary authorities. However, there were claims that some ANVISA's port offices did not accept the NORMAM-20 form.[469]

The information on ballast water from ships should be required just through one type of BWRF that could be used for both the Maritime Authority and ANVISA, as well as for any other institution interested in analyzing the data. Considering that both current BWRF models are adopted by more flexible legal instruments, such as NORMAM-20 and Resolution RDC 217, the solution for this unwanted ambiguity should be easily reached. Moreover, in order to facilitate the updated analysis of BWRFs and the accessibility of the data by all interested institutions and/or organizations, the implementation of an online system similar to the U.S. NBIC[470] could be considered and developed.

NORMAM-20 recognizes that operational measures, as the oceanic exchange of ballast water, are not fully satisfactory and that there is a need for the development of new technologies and equipment for BWM. In accordance with this Norm, the new methods of BWM can be accepted as an alternative as long as they assure at least the same level of protection to the environment, human health, property, and natural resources. In addition, these methods would also have to be approved by the MEPC. However, as previously outlined, the lack of such new technologies and equipment for BWM still occurs and recently forceed IMO to postpone the enforcement of the D-2 Standard for ships to be built in 2009 with less than 5,000 m^3 ballast water capacity.

[468] Alexandre de Carvalho Leal Neto, personal communication by email, 19 July 2007.
[469] *Ibid*.
[470] More on the National Ballast Information Clearinghouse database available on: http://invasions.si.edu/nbic/.

Regarding the establishment of alternative areas for ships to discharge their ballast water when they cannot perform the open ocean exchange due to technical difficulties and/or situations of risks for the vessel, an academic study was undertaken by an agent of ANVISA[471] to determinate such alternative areas for ships calling on the port of Salvador. However, although the identified areas would perhaps be adequate for solving the aspects related to the safety of human health and consequently the introduction of pathogenic agents, it is clear that they do not prevent the risks of biological invasions. The areas were delimited in the Salvador Canal, the main entry of the All Saints Bay,[472] the largest bay in Brazil with 1,052 km^2 of area, which encompass the state Environmental Protection Area (APA) of All Saints Bay and the federal Marine Extractive Reserve (Resex) of Iguape Bay.[473]

The All Saints Bay has historical, cultural and environmental importance, possessing many significant ecosystems, including mangroves, estuaries, sand beaches, Atlantic Forrest, coral reefs, etc. This bay also has on its margin one of the biggest Brazilian state capitals, Salvador, with around 3 million people living in its metropolitan area, many other small towns, two of the biggest ports in Brazil, and many private port terminals, some of them serving the petrochemical pole of Camaçari. Due to these facts, in addition to inefficient effluent treatment systems for urban areas, aquaculture, and industrial activities, overfishing, including the use of explosives for fishing, and a historical lack of enforcement of environmental requirements and public surveillance, the All Saints Bay already confronts many significant environmental problems including some related to ballast water discharges.[474]

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[471] Luiz Jorge Silva Teles, Águas de Lastro e Sustentabilidade: Identificação de Áreas para Deslastre por Geoprocessamento – Estudo de Caso na Baía de Todos os Santos-BA. Masters Dissertation on Sustainable Development. Universidade de Brasília (UNB), Centro de Desenvolvimento Sustentável, Programa de Pós-Graduação em Desenvolvimento Sustentável. Orientador: Dr. Carlos Hiroo Saito. 2004.

[472] All Saints Bay (Baía de Todos os Santos in Portuguese) was discovered by Américo Vespúcio in 1 November 1501.

[473] Both APA and Resex are types of conservation units for sustainable use prescribed by Federal Law nº 9985/2000 (respectively Articles 15 and 18 of this Law) and the Federal Decree nº 4340/2002 that regulates the Brazilian National System of Conservation Units (SNUC). The APA of All Saints Bay was established by the State Decree nº 7595/1999 of Bahia and covers an area of 800 km^2, 76% of the total area of the bay. The Resex of Iguape Bay was establish by a Federal Decree of 11/08/2000.

[474] The alien species of crab *Charybdis hellerii* (Milne-Edwards, 1867) – see Annex 1 – is established in the All Saints Bay and has caused environmental and social impacts. In 2007, a bloom of harmful algae occurred inside the bay causing the death of about 50 tons of fish. The species responsible for this "red tide" was not an alien species (*Gymnodinium sanguineum*) but through uptakes of ballast water in the many ports and terminals inside the bay it can be transferred to other areas where it does not exist.

The Salvador Canal, location of the proposed ballast water exchange sites, is under a strong semi-diurnal tide[475] regime that would limit the exchanges' performances only to the ebbing tide in order to not permit the organisms enter the bay. However this would be a weak approach for avoiding biological invasions, as the alien species could reach other coastal areas outside the bay and later enter in its internal waters. The areas would also not conform with the requirement of NORMAM-20 and BWMC for not delaying ships, as they would need to wait for one of the two daily ebbing tide periods to perform the exchanges. Moreover, although exchange in these areas may not violate the law with respect to discharging ballast water in ecologically sensitive areas and conservation units,[476] it would certainly pose threats to the above enumerated ecological areas.

As previously outlined, NORMAM-20 establishes that in cases that ships could not perform the ballast water exchange beyond 200 nm from the coast line, it has to be done at least in areas not closer than 50 nm and 200 meters of depth.[477] Therefore, the definition of alternative coastal areas for ballast water discharges that could satisfy at the same time the need for protecting the marine environments and also to not cause economical losses to the shipping industry seems to be a difficult and highly limited process.

5.5.1 Provisions related to ports

Regarding ports, NORMAM-20 also recognizes the importance of gathering local and seasonal environmental and sanitary information, which should be consolidated in the development and implementation of Ballast Water Management Plan for ports.[478] The Maritime Authority must communicate to the maritime agencies about the areas where the ships could not take ballast water due to known improper conditions such as areas with algal bloom occurrences, infestations or populations of harmful aquatic organisms and/or pathogenic agents, and areas where dredging activities occur.[479] However, this type of information should first be supplied to the Maritime Authority by environmental and public

[475] With similar two high and two low tides each lunar day.
[476] Section 2.3.3 (j), NORMAM-20.
[477] Section 2.3.3 (b), NORMAM-20.
[478] Chapter 2, item 2.3.3 (i) – General Guidelines for Ships Ballast Water Exchange, NORMAM-20.
[479] *Ibid.*

health agencies and by universities and research institutions.[480] Thus, the Maritime Authority should also be able to inform ships of the most appropriate areas where ships could take and discharge ballast water.

Still regarding ports, NORMAM-20 did not make reference to the implementation of ballast water reception and treatment facilities on land. This alternative has already been pointed out as not a feasible measure for the Brazilian port system due to:[481]

- The lack of physical space in ports – most of the Brazilian ports were built during the inception of cities, that developed without planning, around and sometimes even through port areas;
- The necessity of high investments – it is estimated that at least US$ 1.5 million will be required to build the facilities in ports with areas equipped with one to five berths.[482] Thus, the total cost can be even higher depending on each port and the availability of areas;
- The possibility of delays in port operations – the use of the reception and treatment facilities would possibly cause delays for ships to finish their port operations;
- The increase of port tariffs – port tariffs would certainly increase to compensate for the initial investments, the maintenance of the facilities, and the time necessary for ships to finish their port operations; and
- The probable short life span of the need for ballast water exchange facilities – according the BWMC, it is expected that in the relatively near future ships will make the necessary adaptations to reach the ideal standards of ballast water quality and exchange, thus becoming able to efficiently and safely exchange their ballast water without the need for land facilities.

5.6 Environmental Licensing of Ports in Brazil

The environmental licensing process is an instrument of the Brazilian National Policy of Environment (PNMA)[483] and its function is to join the economic development with environmental conservation. The correct application of this instrument guarantees public[484]

[480] *Ibid*.
[481] Luciola Perez de Almeida and Alexandre de Carvalho Leal Neto, Convenção internacional para controle e gestão de água de lastro, *op cit*. p. 7; [and] results of discussions during the meeting organized in 2006 by ANTAQ on the state-of-the-art of BWM in Brazil.
[482] According Altevir Caron Jr. and his personal communication with Dr. Gabriel Ferrer of the University of Alicante (Spain) during a presentation in the Seminar on the Sustainability of Ports Adjacencies held in the University of the Valley of Itajaí, October 2005.
[483] Articles 9 (IV) and 10 of Brazilian Federal Law nº 6938/1981.
[484] According to Article 225 (1) (IV), Federal Constitution of 1988, which determine to the public power the duty to require, in the form of the law, for installation of construction or activity that may cause significant degradation of the environment, prior study of environmental impact, which will be published. According to the Article 10

recognition to the investors and entrepreneurs that its activities are developed in compliance with the requirements of the environmental legislation.

In 1997, to fulfill its legal mandate,[485] CONAMA formulated a specific resolution[486] prescribing general procedures and criteria for the environmental licensing process, which is defined as:

> Administrative procedure through which the competent environmental agency permits the location, installation, enlargement and operation of facilities and activities that use natural resources considered effective or potentially pollutant or that, under any form, can cause environmental degradation […][487]

At the time of SISNAMA's creation in 1981, the competence to conduct the environmental licensing process in Brazil was mainly delegated to the states' environmental agencies and the federal agency would only act in a supplementary way.[488] However, the CONAMA Resolution nº 237/1997 prescribed that the definition of the institution competent to conduct the environmental licensing process must include a determination of the range of impacts associated with the facilities or activities, and not only consider the location or the control of the affected area. This approach was reaffirmed later by the legal consulting team of the MMA in its analysis of the dispute between IBAMA and the environmental agency of Santa Catarina (SC) which respect to which agency should be responsible for the environmental licensing of a shipyard company in that state.[489] Therefore, considering the CONAMA Resolution nº 237/1997 general disposition:

- The municipal environmental agency is responsible for conducting the environmental licensing of facilities and activities with local impacts, or for conducting those licensing processes delegated by the State through a legal instrument or agreement;[490]

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(1), Federal Law nº 6938/1981 all applications for environmental licensing, its renewal, and its concession must be published in the official periodical journal of the state, as well as in a journal of large regional or local circulation. The specific manner to apply this publication was later regulated by the CONAMA Resolution nº 6/1986.

[485] Article 8, Brazilian Federal Law nº 6938/1981.

[486] CONAMA Resolution nº 237/1997.

[487] Article 1 (I), CONAMA Resolution nº 237/1997.

[488] Article 10, Brazilian Federal Law nº 6938/1981.

[489] Legal Interpretation Report nº 312/CONJUR/MMA/2004, regarding a conflict of competence between IBAMA and FATMA/SC for the environmental licensing of the Aker Promar shipyard, in the city of Navegantes/SC. p.21 conclusions (d) and (e).

[490] Article 6, CONAMA Resolution nº 237/1997.

- The state environmental agency is responsible for conducting the environmental licensing of facilities and activities whose direct impacts exceed the territorial limits of one or more cities, or for conducting those licensing processes delegated by the Federal Government through a legal instrument or agreement;[491] and
- The federal environmental agency is responsible for conducting the environmental licensing of facilities and activities with significant nationwide or regional impacts,[492] that means those environmental impacts that affect directly, in all or in part, the territory of two more states.[493] These enterprises also should be located or developed in the following locations: the territorial sea, the continental shelf, the EEZ, and on indigenous reserves or environmental conservation units of the Federal Government. Federal licensing should also be applied when facilities or activities take place in two or more states or when they exceed the territorial limits of the country. Lastly, the Federal Agency is also responsible for licensing facilities and activities that correspond to military bases and those that explore or use radioactive material or nuclear energy in any of its forms and applications.

Despite CONAMA's clarification, there is still widespread confusion and misinterpretation of the law, especially for facilities located on the shoreline, such as maritime ports and terminals. Currently, some of the Brazilian ports are licensed by the federal environmental agency, some are licensed by state agencies and some are licensed by both federal and state agencies at the same time. This lack of understanding of the law shows the desperate need for a review of the current legislation and, eventually, the creation of a clearer definition of responsibilities regarding the competence to conduct the environmental licensing. This could be done through a new legislation that details the relevant part of the Brazilian Federal Constitution.[494]

Due to the fact that most of the ports were constructed before the adoption of the present environmental legislation, the environmental licensing process serves to promote their environmental regularization.[495] Therefore, different from the one applied to new projects, this process has as its objective to promote the adoption of environmental control and recovery measures by those enterprises already in operation. Almost all of these measures are requirements of the environmental agencies for granting the operation license to port

[491] Article 5, CONAMA Resolution nº 237/1997.
[492] Article 4, CONAMA Resolution nº 237/1997.
[493] Article 1 (IV), CONAMA Resolution nº 237/1997.
[494] Article 23 of the Brazilian Federal Constitution, which lists the common competences of the Federal Government, the states, the Federal District and the cities.
[495] Article 34 of the Brazilian Federal **Decree** nº 4340/2002.

administrations. This license establishes all environmental plans and programs that port managers must adopt during a specific period in order to maintain the document legally valid and for not incurring environmental crimes. Table 19 below lists the main programs required during the environmental licensing of ports and the specific legislation that describes many of them.

Table 19. Programs and plans required for environmental licensing of ports in Brazil

Plan or Program	Legislation
Water Quality Monitoring Program	CONAMA nº 357/2005
Sediment Monitoring Program	CONAMA nº 344/2004
Recovery of Degraded Areas Program	NBR 13030[496]
Aquatic Biota Monitoring Program	There is no specific legislation.
Solid Residues Management Program	NBR 10004, CONAMA nº 005/1993, Resolutions RDC nº 217/2001 and nº 342/2002.
Effluent Management Program	CONAMA nº 357/2005
Manual of Internal Procedures for Oil Pollution Risk Assessment	Article 6, Federal Law 9.966/2000
Environmental Risks Prevention Program	NR 9; NR 29[497]
Emergency Control Plan and Mutual Aid Plan	NR 29
Environmental Education and Social Communication Program	There is no specific legislation.
Construction Environmental Control Program	CONAMA nº 307/2002
Individual Emergency Plan for Oil Spill	Article 7, Federal Law 9.966/2000; CONAMA nº 293/2001
Air Quality Control Plan	CONAMA nº 005/1989, 003/1990, 008/1990
Noises Emission Control Plan	CONAMA nº 001/1990
Environmental Auditorship	Article 9, Federal Law 9.966/2000; CONAMA nº 306/2002

Regarding ballast water, some requirements have started to be prescribed by IBAMA for the regularization of ports under its competence. In the term of reference (TR) sent for the Port

[496] Brazilian Standard (NBR) nº 13030 of the Brazilian Association of Technical Standards (ABNT).
[497] Regulatory Norm (NR) nº 29 of the Brazilian Ministry of Work and Employment (MTE).

Authority of the port of Santos was included the requirement of a “Program for Verification of Ships Ballast Water Management”. The TR is the document that determines the coverage of procedures and criteria that have to be followed for the elaboration of the Environmental Study that will subsidize the environmental licensing. According the TR, this program should contain, at a minimum:

- A request to the ship representatives for the NORMAM-20 BWRFs;
- Verification of the adoption of necessary measures for the control and prevention of alien species introduction, as required by NORMAM-20;
- Elaboration of a register for each ship, with information on the type and origin of the ship, the ballast water origin, date and location of ballast water exchanges, and date and location of ballast water discharges; and
- Proposal of a social communication program for the crew, focused on the specific problems related to ballast water and its measures of prevention, including aspects of national and international legislation which address the matter.

It is clear that almost all items required in this program are related to the measures that must be fulfilled by ships in compliance with NORMAM-20. Hence, the environmental agency makes a mistake when attributing to a port authority the responsibility to follow and inspect the compliance of the NORMAM-20 by ships due to the fact that it is the competence of the Maritime Authority.[498] Nevertheless, it is important the idea for adopting a communication and environmental education program directed to the crew alerting them of the dangers associated with the improper discharge of ballast water and requesting their contribution to prevent the possible environmental impacts. However, to reach these goals, the program should also count on the involvement of the other authorities present in the port.

Actually, considering the recommendations of IMO, the role of the Brazilian port authorities in the process of BWM could be played in a different way. Extending the purpose of some of the programs already prescribed by the environmental licensing of ports, the environmental and sanitary information generated by them could be used in a BWM Plan for Ports. For instance, the integration of data obtained through the Aquatic Biota and Water Quality Monitoring Programs could provide information on the presence of alien species and

[498] According to the Chapter 4 of the NORMAM-20, it is up to the Naval Inspector to verify the compliance of its requirements by ships.

the establishment of appropriate places for ballast and unballast operations in port areas. Considering its relevance, other plans and programs such as Effluent Management, Dredging Monitoring, and Social Communication Programs can also be integrated in the process of port management of ballast water. Therefore, as some approaches under development in some European port areas, a specific program on port ballast water management should include:[499]

- Risk assessments using the compatible methodology developed under IMO/GloBallast Programme;
- A list of identified alien species in the port area and adjacent waters;
- A list of those native species living in the port area and adjacent waters that could became alien species and cause harm in waters of those ports connected by shipping trade routes;
- On the amount and origin of ballast water discharged annually in the port area;
- An public early-warning system on new introductions and dispersions of invasive alien species and warning of outbreaks of harmful organisms which may affect the suitability of ballast water uptake, other activities undertaken in areas under influence of port operations, and the public health;
- General information on water quality and abiotic conditions in port areas;
- Identification of the correct places for uptake and discharge of ballast water in port areas; and
- Information systems for ships about dredging activities and other situations that could affect ballast and unballast operations, as well as on ideal places for their operations.

Since ships are directly responsible for the ballast water discharges, it could be reasonable that the costs for amplifying the range of such programs would be shared with the shipping industry. In fact, this should not just be related to ballast water problems, but with all aspects of ships operations that affect ports' environments. This seems to be applicable with the polluter-pays principle, which is "the principle to be used for allocating costs of pollution

[499] According LIFE Focus I Alien species and nature conservation in the EU. The role of the LIFE program Awareness raising campaigns may be essential activities not only for preventing new invasions of exotic species but also for ensuring public support on eradication and control programs; ICES Advisory Committee on the Marine Environment. ICES WGBOSV Report 2006, *op cit.* p. 84; Report of the BSRP/HELCOM/COLAR. 2005, *op cit.* p. 5.

prevention and control measures to encourage rational use of scarce environmental resources and to avoid distortions in international trade and investment."[500]

Therefore, since ships use and impact port environments, the costs for port authorities taking care of these areas through the implementation of monitoring, control, and recovery programs or plans should obviously be shared with ship-owners. The polluter, in this case ships, should assume their responsibility paying a just part of the expenses for carrying out all management measures imposed by public authorities to protect the environment against the impacts of their activities. Therefore, the costs of these programs should be additionally supported by a fraction of the port taxes, like a "port environmental tariff," and not only by public resources which are very often not sufficient or even available for this purpose. This way the port authorities, through specific environmental units or sectors implemented in their organizational structure, could be able to better adjust and execute environmental programs and port surveys also necessary for the local and national BWM.

5.7 Concluding Remarks

Chapter 5 has outlined the current approach to BWM implemented in Brazil. A series of limitations were exposed, including the limited use of the ballast water exchange in open ocean waters as an effective measure to avoid ballast water impacts. As previously outlined, these limits are amplified in the case of Brazil mainly due to the lack of enforcement of environmental legislation, inadequate and insufficient human and material resources for the competent public authorities undertaking ship inspections and monitoring the environments used by them, environmental degradation of many port areas, insufficient implementation by ships of the correct ballast water exchange guidelines, lack of standard regulation for port monitoring and survey programs.

It was also demonstrated in the present chapter that Brazil is a great importer of ballast water and that there is potential for this condition to increase in the near future due to expected investments in ports and waterways infra-structures and the increase of oil exports. Therefore,

[500] Recommendation of the Organization for Economic Co-Operation and Development (OECD) Council on Guiding Principles concerning International Economic Aspects of Environmental Policies: C(72)128, 26 May 1972. Available in http://webdomino.oecd.org/horizontal/oecdacts.nfs/linkto/C(72)128.

considering the inefficiency of the present strategy for BWM, there is no doubt that the various important aquatic ecosystems present along the Brazilian coast and in its continental waterways are still under significant threats. Consequently, it is crucial that efforts to improve the Brazilian national BWM program must be taken as soon as possible and that all actors involved with this issue should better integrate their actions. One of the strategies that could be adopted through the environmental licensing of ports is the inclusion of alien species and pathogenic agents in the environmental monitoring and survey programs required by the competent environmental agencies. However this approach would depend on the adoption of national standards for these programs.

Since in Brazil the protection of the environment is a general constitutional duty of the Public Power and also society, the discussions on ballast water issues, as well the access to data obtained through BWRFs should be open and more easily accessible. Moreover, new initiatives undertook with the purpose to improve the legal instruments addressing BWM must be better developed and adopted. Finally, since Brazil was one of the first States to sign the BWMC and was also one of the first sites of the GloBallast Programme, legislative efforts should be undertaken to ratify the BWMC.

Chapter 6 Conclusion

6.1 Summary

It has been more than 17 years since the beginning of the first international approaches to solve the problems related to the use of ballast water by ships. Despite the significant technological advances achieved during this period by the shipping industry to make its ships capable for carrying more cargo and sailing faster, which have generated greater profits, a definitive solution to the environmental risks related to ballast water has not yet been achieved. The problem of biological invasions is known as one of the major threats to aquatic environments in the world, and the involvement of shipping as a vector for alien species and pathogenic agents has been internationally suggested at various conferences and recognized by the provisions of treaties.

Despite that ballast water oceanic exchange, the principal measure currently applicable to BWM, has been adopted by some States as a compulsory requirement, it remains mostly as a voluntary measure worldwide as the BWMC has not yet entered into force. Furthermore, the execution of this measure may have several technical impediments and, even when accomplished exactly following the current international guidelines, it does not guarantee a full elimination of the risks of biological invasions, which makes it a BWM measure of very limited effectiveness. The use of on-board ballast water treatment systems by ships has been identified as the ideal alternative to efficiently eliminate the transfer of exotic species and pathogenic agents between ports of the world. However, these systems must satisfy several conditions related to economical, environmental, and technical feasibility, which have been causing delays in their development and general implementation.

The U.S. Government and many private American institutions set aside significant amounts of money annually to mitigate the impacts caused by diverse alien species living in their territory. Several of these species, including the zebra mussel, were introduced via ballast water. In view of this, and since 1990, some legislation has been adopted specifically addressing BWM in the U.S. In addition to making the ballast water exchange in oceanic waters compulsory for all vessels originating from ports beyond 200 nm that whish discharge

ballast water in American ports, the U.S. Government also established two important integrated bodies: the NBIC maintained by its USCG, and ANSTF that is composed of representatives of all Government institutions related to all aspects involving alien species and their impacts.

Considering the significant regional environmental importance of the Great Lakes hydrological system, as well as the serious impacts already imposed in this region by many alien species introductions, U.S. and Canadian authorities have been working together through an official bilateral cooperation agreement to provide stricter BWM. This specific approach undertaken by these agencies promotes greater efforts for controlling and inspecting all vessels declaring ballast water on board and calling on ports in the Great Lakes and associated environments. However, despite the existence of specific federal legislation addressing BWM, many institutions and American representatives recognize its limitations and have been working on new bills that seek to improve the requirements and implement them in a more standard way throughout all U.S. waters. The legislative and technical aspects of development process of these bills seems to be undertaken not only by the U.S. Congress, but also by representatives of the American port and shipping industries, as well as environmental, academic and other Governmental institutions.

The EU Member States have already adopted regional treaties that specifically promote the preservation of the marine environments and coastal regions of Europe. Although these treaties encompass many marine and coastal environmental matters, the negative aspects of the use of ballast water by ships seem to not be adequately considered in most of the European States' legislation. Currently, a small number of EU Member States have been showing considerable advance in the process of internalizing the BWMC guidelines and Norway has already ratified the Convention. One important reason for these lacunas is the existence of technical difficulties to implement the BWMC provisions by ships sailing in European waters, especially the oceanic exchange due to specific regional characteristics of the European coastal zone and the routes of navigation. Another reason could be related to the fact that many important companies in the world shipping industry are based in EU Member States, thus these would be directly and significantly affected if a generalized adoption of the stricter legal requirements of the BWM occurred in Europe.

It is fact, the negative impacts and losses caused by ballast water do not affect the shipping industry itself, which combined with its significant economic and political power, may negatively influence the process for finding an early solution to the problem. Considering the importance that the European continent has in worldwide navigation as well as in the international debates addressing the development and adoption of environmental policies, it can be considered that, up till now, the efforts destined for adopting specific legal measures of BWM in the region are quite disappointing. On the other hand, several EU institutions have given great importance to studies on ballast water risk assessment and the environmental characterization of the European ports and coastal areas as tools of BWM. Moreover, monitoring programs have been undertaken including the identification of alien species and native species potentially harmful for other environments. Several regional working groups have already been created and efforts have been made for the integration of the existing information in a continental perspective. Many important port administrations and other port organizations both in the U.S. and Europe have been investing significant resources for improving the environmental quality of their port areas. Moreover, the planning and implementation phases of this process have been undertaken with the participation of other academic, Governmental and private institutions.

Considering the huge importance of both U.S. and Europe in international trade, especially in shipping since it is responsible for carrying more than 90% of the loads globally commercialized, the adoption of more stringent and efficient measures for BWM in their waters, including port areas, can significantly influence the development and adoption of similar polices by developing States like Brazil. This is exactly what could be observed during the process for the development, adoption, and implementation of the mandatory security measures of the International Ship and Port Facility Security Code (ISPS Code)[501] by Governments, port authorities, and shipping companies. The implementation of the ISPS Code became a strict condition for allowing trade operations between ports, which in turn has major

[501] IMO, the International Ship and Port Facilities Security Code (ISPS Code). Regulation XI-2/3, Chapter XI-2 – Special Measures to Enhance Maritime Security, International Convention for the Safety of Life at Sea (SOLAS, 1974). The ISPS Code was adopted by the Diplomatic Conference on Maritime Security held in London on 12 December 2002 (Annex 1, Conference Resolution 2 – Adoption of the International Code for the Security of Ships and of Port Facilities), and entered into force on 1 July 2004.

economic importance for the global trade and consequently for the shipping industry. Therefore, its worldwide implementation has been proceeding in quite an accelerated manner.

Brazil was one of the first States to sign the BWMC and oceanic exchange is currently a compulsory measure for all vessels calling on its ports with ballast water on board. However, Brazil has not yet ratified the BWMC and the above outlined single requirement of ballast water oceanic exchange does not promote an efficient national BWM. The lack of adequate structure that allows competent authorities to accomplish their duties in order to stimulate correct compliance with the oceanic exchange by all vessels, as well as a general lack of enforcement of environmental legislation promotes a scenario quite propitious for new biological invasions in Brazilian waters. Moreover, despite that Brazil had been one of the participants in the first phase of the GloBallast Programme, so far there has been no Government effort for the implementation of its methodology for risk assessment in all major Brazilian ports. Furthermore, the risks related to ballast water discharges are further increased due to conditions of environmental degradation existing in most Brazilian port areas, inadequate commitment of port administrations, and the lack of deployment of resources for environmental issues.

Currently, the ports environmental characterization and monitoring are being reasonably developed by just a few port authorities, but the information gathered by them cannot be nationally integrated due to the lack of national standards for the implementation of these port environmental programs. Therefore, differences exist between data from different Brazilian port areas related to environmental parameters selected, methods for defining and undertaking sampling campaigns, analytical analysis and data interpretation. Moreover, there is a need for better integration between the various institutions responsible for applying the requirements of the environmental legislation and those related specifically to the BWM approach in Brazil.

Considering what has been presented above throughout the present study on the deficiencies of both BWM approaches and port environmental management currently implemented in Brazil, as well as the measures outlined from the BWM approaches undertaken by the U.S. and some of the EU Member States, the following actions should be considered as potential alternatives to the necessary and urgent improvement for the Brazilian BWM approach:

1. National integration and publicity of ballast water data: The adoption of an alternative electronic BWRF to be accessed and submitted online by ships and the establishment of a national clearinghouse for promoting the integration and publicity of ballast water data collected through all BWRFs. Following Item 2.3.2, Chapter 2 of NORMAM-20, this clearinghouse could be properly managed by IEAPM, which should be provided with the necessary resources to accomplish effectively the task. The implementation of an efficient national ballast water clearinghouse could allow an easier contribution of other research institutes such as universities concerned with the specific issue and the conservation and protection of aquatic environments or human health since currently the BWRFs are not easily available as public documents but should be. Taking into consideration that the BWRF is officially required in Brazil since 2008 and until now there is not even a national estimate of the total volume of ballast water discharged in Brazilian waters based on the BWRFs data, this specific clearinghouse could be responsible not just for shelving the documents, but analyzing their data and making them really useful for the national BWM approach;

2. National standards for environmental licensing of ports: Considering the need for standards data from ports surveys and environmental monitoring programs to improve the Brazilian BWM approach, the SISNAMA structure, and the environmental licensing as one of the most important instruments of PNMA, initiatives should be undertaken for promoting a national standardization of all procedures and environmental measures required through the process of environmental licensing of ports. This goal could be established through the adoption of a CONAMA resolution that specifically addresses the issue and, amongst other measures, should include the requirement of a specific program for ballast water management in port areas. Therefore, a specific technical working group must be formed and composed by representatives of all institutions enumerated in Section 5.3 of this study, as well as from any private port organization and academic institutions interested;

3. Implementation of a national system of port environmental data: This system would integrate standard data from environmental studies and permanent monitoring programs of port areas undertaken by all port authorities and port terminal administrations as requirements of their environmental licensing processes. Therefore, it will be necessary for federal and state institutions to compose this system and its structure. As with the above mentioned national ballast water clearinghouse and considering the special importance of the principle of publicity in the environmental licensing processes, this national system of port environmental data must be easily available for public access in order to permit the development of more and deeper studies by all types of institutions. This publicity must be achieved through all means possible, including at least a constantly updated online database and an annual official publication on Brazilian port environmental data. Considering the above, this system would include data on alien species and potential harmful native species living in port areas and their adjacent areas, which in turn could contribute as a source of information for the national database on invasive species of MMA. Moreover, the collection of environmental data of port areas could also be useful in drawing up maps of environmental sensitive coastal areas under direct

influence of port activities. Like the maps of environmental sensitivity for oil which are used for assessing risks related to oil spills, these maps may be also useful for ballast water risk assessments and the management of biological invasions. There is also an important need for this system to be developed so that it is compatible with the GloBallast international database, enabling its use also for international approaches to BWM, which could contribute to the CBD COP6 Decision VI/23 (2002) on the need for creating a global cooperative information network on invasive species that could facilitate information exchange, research and management of the problem at various levels (local, regional, national and global);

4. BWM measures for navigation within 200 nm: Considering the risk of dispersion of many established alien species in Brazilian coastal areas and other American waters not yet invaded, there is a need for developing and adopting specific BWM measures for vessels sailing exclusively within 200 nm, such as those engaged in cabotage or in transit between Brazilian ports and ports located in neighboring countries or even in other regions of the Americas;

5. Regional BWM: Considering Article 13 of the BWMC on "technical assistance, co-operation and regional cooperation," Brazil must seek the establishment of joint efforts with neighboring countries for preventing the ballast water impacts on a regional scale. This regional approach is currently topical because of the introduction and dispersion of the golden mussel in Brazil, Uruguay, Paraguay, and Argentina. Such efforts could also be the object of an environmental agenda of Mercosul or other regional or even bilateral agreements;

6. Ports' environmental agenda: Effective implementation of the environmental agenda by all Brazilian ports, particularly its provisions regarding the need for the establishment of well-structured environmental units or centers directly linked to the executive directorate of port authorities. These environmental units would be responsible for the compliance with all legal environmental requirements, especially those provided through the environmental licensing of ports, which refers to the environmental studies and monitoring programs to be used by the national BWM approach;

7. Reception and treatment facilities: Regarding ballast water reception and treatment facilities in port areas, considering the high costs for its construction, maintenance, and operation, as well as the lack of space for its implementation and its potential limited life span after the adoption of on-board ballast water treatment systems by ships, this alternative for BWM does not seem to be practicable for Brazil. Nevertheless, there is a need for facilities where the maintenance of ballast tanks and removal of its sediments could be undertaken without risks of biological invasions. The removal, transportation, and treatment of the ballast tanks' sediments must be undertaken according to specific and safe procedures and the facilities, usually shipyards, must be specifically licensed for these services and must be under surveillance of the competent environmental and sanitary authorities;

8. Sanitation development of port areas: Considering the risks specially associated with the transference and introduction of pathogenic agents and other harmful substances, as well as the current sanitation conditions of a great part of the

Brazilian port waters, special attention could be given to these areas through national and state approaches to cities' sanitation development, with the discussion and implementation of a specific program for port cities with emphasis on the improvement of water quality of their port areas;

9. Enforcement of BWM regulation: The promotion of a more effective enforcement of NORMAM-20 provisions, mainly through the destination of all necessary resources for making the Maritime Authority and ANVISA technically and operationally capable of accomplishing their inspection duties related to BWM; and
10. BWMC ratification: Finally, considering the achievement of a coherent conduct by the State of Brazil as a Member of IMO with all significant efforts already undertaken by several of its federal institutions for contributing to the development of international guidelines for BWM, as well as its participation in the first phase of the GloBallast Programme, and the need for a more open and continued discussion on the legal adoption of complementary measures for the national BWM approach, the Brazilian congress shall develop and advance the process for Brazil ratifying the BWMC as soon as possible.

6.2 Evaluation

This study concluded that the national approach currently applied in Brazil does not guarantee the effective prevention of negative impacts related to ballast water discharges. The study identified some alternative ideas that could be better developed and may be adopted for promoting a more strict and efficient national BWM program. Therefore, greater control of ballast water discharges and better protection of aquatic environments under risks of new biological invasions could be achieved, especially in port areas. However, it was also verified that until efficient on-board ballast water treatment systems have been developed and implemented on vessels, the total prevention of new introductions of alien species and pathogenic agents through ballast water and their consequent impacts cannot be achieved.

This study described the main international mechanisms that can be related to the aspects of ballast water, especially those specifically developed under IMO. Similarly, the study presented in a general way the BWM approaches currently in use by the U.S. and the EU. In addition, this study recognized the measures and strategies adopted in these approaches that could serve as references for the development of the Brazilian efforts on BWM.

Concerning exclusively the Brazilian situation, this study presented a general national panorama that includes some aspects of the natural characteristics and vulnerability of the

coastal zone, which encompass many environmental resources of huge ecological, economic and social importance. The Brazilian port system was also included in this panorama, with emphasis on its environmental component that currently is not adequately managed by the majority of port authorities, the description of its national composition and structure, and the significant economic development of its port operations throughout the last years. Following this perspective, the principal governmental institutions that should integrate all forums addressing BWM were presented and the main legal instruments relating to BWM were analyzed in order to identify limitations and possible improvements. Finally, the study presented the environmental licensing process for ports in Brazil, presenting its applicability to improve and help the Brazilian BWM approach to become more effective in the achievement of its goal.

6.3 Future Work

During the development of this study, it was possible to note the existence of a lack in updated and more accurate ballast water estimates not only in Brazil but in many other States. The reasons for this lacuna in Brazil were identified and it is noted that these are probably common to developing States. The control of ballast water volumes discharged may not be the most important issue for BWM, neither the principal data for risk assessment of ports, but its absence may reveal deficiencies in the governance of this important environmental issue. This study presented a partial estimate of ballast water discharges in Brazil that is certainly underestimated due to the insufficient information on which it was based. Therefore, more studies on this subject are necessary and could be encouraged through the dissemination of the methods for the estimate of ballast water volumes and port risk assessment in universities and other academic and research institutions present in many coastal and port cities. Moreover, these studies could use the already available data on port operations, the data from BWRFs, and data on port environments that this study proposes to make more readily available in the near future.

Considering what this study achieved, more studies and discussions are necessary so as to define the details of some of its recommended actions and strategies for effectively implementing these. Therefore, it is clear that more studies on the development of port

environmental management, BWM, and the improvement of applicable legislation are needed. Considering the need for integrated approaches, some of these studies must be officially developed by working groups composed of specialists and representatives of the relevant agencies. Other broader studies are also needed on ships as alien species vectors in Brazil, since they play this role not only because the use of ballast water. Thus, such studies must better consider the sediments accumulated in ballast tanks and also include the significance of the ships' hulls for transporting, introducing, and dispersing alien species in the Brazilian aquatic environments.

References

[1] Christopher F. Wooldridge *et al*, Environmental management of ports and harbours - implementation of policy through scientific monitoring. Marine Policy, v. 23, n^{o} 4-5, p. 413-425, 1999.

[2] E. Peris-Mora *et al*, Development of a system of indicators for sustainable port management. Marine Pollution Bulletin v. 50, p.1649–1660, 2005.

[3] Gillian Reynolds. Operational pollution from shipping: Sources, environmental impacts and global contribution. p. 233-256. In: David Pinder and Brian Slack. Shipping and Ports in the Twenty-First Century: Globalization, Technical Change and the Environment. Routledge, Taylor & Francis Group, 2004.

[4] Giuseppe Cognetti and Ferruccio Maltagliati, Editorial - Port activities and international environmental control in the Mediterranean. Marine Pollution Bulletin v. 50, p. 119–120, 2005.

[5] Giuseppe Cognetti, Editorial - Environmental Control and Port Management: Funding, Technology and Professional Training. Marine Pollution Bulletin v. 36, p. 862-863, 1998.

[6] IMO, International Shipping – Carrier of World Trade. Background paper. IMO brochure for World Maritime Day, 2005.

[7] IMO, International Shipping and World Trade: Facts and figures. IMO Library Services, External Relations Office. Last update: 21 February 2006.

[8] Jeffrey W. Monroe and Robert J. Stewart. Dictionary of Maritime and Transportation Terms. 440 p. Cornell Maritime Press, August 2005.

[9] R. Mann, The local costs to ecological services associated with high seas global transport. p. 25-38, In: Julia L. Davenport and John Davenport, The Ecology of Transportation: Managing Mobility for the Environment. Springer, 1st edition, 392 p. 2006.

[10] R.M. Darbra *et al*, A procedure for identifying significant environmental aspects in sea ports. Marine Pollution Bulletin v. 50, p. 866–874, 2005.

[11] R.M. Darbra *et al*, The Self Diagnosis Method: A new methodology to assess environmental management in sea ports. Marine Pollution Bulletin v. 48, p. 420–428, 2004.

[12] Sam Bateman, Environmental issues with Australian ports. Ocean & Coastal Management, v. 33, n^{o} 1-3, p. 229-247, 1996.

[13] Wayne K. Talley, Environmental Impacts of Shipping. p. 279-292, In: David A. Hensher and Kenneth J. Button, Handbook of Transport and the Environment. Elsevier Science, 650 p. 2003.

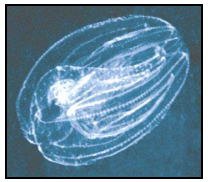
Annexes

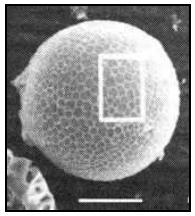
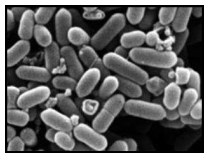
Annex 1. Examples of Alien Species Introductions and Impacts

Common name and Pictures	Scientific Name	Origin	Countries with occurrence registers.	Impacts	References
Zebra Mussel 	*Dreissena polymorpha* (Pallas, 1769)	Russia, Caspian and Black Seas.	The zebra mussel has invaded many areas in different countries, including Canada (Great Lakes); Denmark; Scandinavia; Germany; Hungary; Ireland; Italy; Netherlands; Poland; Switzerland; England; Scotland; USA (Great Lakes, Hudson River, Illinois River, Mississippi River Drainage, Ohio River).	It filters organic and inorganic particles present in the water with great efficiency. Due to its large population in the Great Lakes, it caused significant changes in the water quality, affecting in a negative way the natural ecosystems both directly and indirectly. It obstructs the water-intake pipeline systems of water users (such as power companies, steel plants, city water suppliers, and golf courses) creating coasts for maintenance. Coasts are also necessary to remove tons of mussel shells from swimming areas in Lake Erie (mussel densities of over 1 million per square yard have been recorded in parts of Lake Erie). The U.S. Fish and Wildlife Service estimates the potential economic impact at $5 billion from 2000 to 2010 to U.S. and Canadian water users within the Great Lakes region alone.	USGS, Zebra Mussels Cause Economic and Ecological Problems in the Great Lakes. Great Lakes Science Center, Department of the Interior - U.S. Geological Survey, GLSC Fact Sheet 2000-6. U.S. The Global Invasive Species Database - GISD (http://www.issg.org/database/). Picture source: USGS (http://nas.er.usgs.gov/).
Golden Mussel 	*Limnoperma fortunei* (Dunker, 1857)	South eastern Asian rivers and creeks, especially in China.	First introduced in 1991 in the Plata Basin, Argentina. Later it spread into Brazil through Parana and Paraguay Rivers, two important continental waterways in that region. It already has been found in the Pantanal, Guaiba Lake, the Hydroelectric plant of Itaipu, the Porto Primavera reservoir of the Tiete-Parana waterway, and in the mouth of the Cuiaba River.	It changes the feeding patterns of local fish, causing fish stocks to fall and affecting the life of traditional fishing communities; obstructs the protector filters of drinking water supplies facilities, demanding more often maintenance; blocks the normal functioning of the Itaipu Hydroelectric, costing around 1 million dollars for each paralyzed day; directly impacting all organisms that use the same niche.	IBAMA, GEO Brasil 2002, *op cit*. IMO and BBC. Invaders from the Sea. EMBRAPA - Documentos 64. Área de Ocorrência do Mexilhão Dourado (*Limnoperna fortunei*) na Bacia do Alto Paraguai, entre os anos de 1998 e 2004. ISSN 1517-1973 Corumbá, MS, 2004. The Global Invasive Species Database - GISD (http://www.issg.org/database/). Picture source: Flávio Fernandez – IEAPM.

Common name and Pictures	Scientific Name	Origin	Countries with occurrence registers.	Impacts	References
Asian clam 	*Potamocorbula amurensis* (Schrenck, 1861)	Japan, China and Korea.	San Francisco Bay, U.S.	Can cause changes to the soft sediment communities of the invaded area, resulting in the decline in the diversity and abundance of benthic species. Can reduce the amount of available space for other species to grow and reproduce. Can negatively affect commercial fisheries.	The Global Invasive Species Database - GISD (http://www.issg.org/database/). Picture source: USGS (http://nas.er.usgs.gov/).
Bicolor purse-oyster 	*Isognomon bicolor* (C.B. Adams, 1845)	Caribbean.	Brazil: Rio de Janeiro (Arraial do Cabo), São Paulo (Caraguatatuba, Guarujá, São Sebastião, Ubatuba)	Competes with native bivalves mainly for space, in some cases causing their eradication. Since many of the native species have a higher commercial value, it can also cause economic losses for people that commercialize this kind of seafood.	IBAMA, GEO Brasil 2002, *op cit*. Ministério do Meio Ambiente and Train-Sea-Coast Brasil. Gerenciamento de Água de Lastro. 2006, *op cit*. p. 33. Picture source: Flávio Fernandez – IEAPM.
Indo-Pacific Swimming Crab 	*Charybdis hellerii* (Milne-Edwards, 1867)	Indonesia and the Pacific Ocean. Japan, Philippines, New Caledonia, Australia, Hawaii, and throughout the Indian Ocean, including the Red Sea.	In Brazil from Santa Catarina to Rio Grande do Norte states, mainly reported in All Saints Bay (Bahia) and Guanabara Bay (Rio de Janeiro). Also in the United States, Australia, India, Israel, Egypt and Lebanon, Cuba, Venezuela, and Colombia. Eastern Mediterranean and western Atlantic.	It has been estimated that in the All Saints Bay it has became more abundant than the indigenous crab *Callinectes larvatus,* an important species for traditional fishing communities.	IBAMA, GEO Brasil 2002, *op cit*. The Smithsonian Marine Station – SMS (http://www.sms.si.edu/irlSpec/Charyb_heller.htm/). Nonindigenous Aquatic Species (NAS) information resource for the United States Geological Survey - USGS (http://nas.er.usgs.gov/). C. L. S. Sampaio and I. L. Rosa, Predation of an alien species of crab (Charybdis hellerii Milne Edwards) by a native Octopus species on NE Brazilian reefs. Coral Reefs, 2005. Picture source: Flávio Fernandez – IEAPM.

Common name and Pictures	Scientific Name	Origin	Countries with occurrence registers.	Impacts	References
Chinese Mitten Crab 	*Eriocheir sinensis* (Milne-Edwards, 1854)	Northern Asia: Pacific coast of China and Korea.	Western Europe, Baltic Sea, and West Coast of North America. United States, Finland, Sweden, Russia, Poland, Germany, the Czech Republic, the Netherlands, Belgium, England, France, Portugal. Patapsco river (near Baltimore), on the upper Chesapeake bay (US Atlantic coast). Also in the Great Lakes, St. Lawrence River, once in Louisiana.	Can affect biodiversity in fresh water and estuarine ecosystems. Can out-compete or preys on vulnerable native fish and invertebrate species. Can burrow into river banks and dykes causing erosion and siltation. Can interfere with aquaculture and commercial and recreational fishing activities (affect the recruitment of commercial species; feed on trapped fish in ponds; steals bait and damages fishing gear). Chinese mitten crabs may also block water intakes in irrigation and water supply schemes. May carry an Oriental lung fluke that infects mammals, including humans (the infestation occurs by eating raw or poorly cooked mitten crabs).	The Global Invasive Species Database - GISD (http://www.issg.org/database/). IMO (http://www.imo.org/Environment/mainframe.asp?topic_id=548/). Nonindigenous Aquatic Species (NAS) information resource for the United States Geological Survey - USGS (http://nas.er.usgs.gov/). ICES, Report of the WGITMO, 2007, *op cit*. Picture source: GISD (http://www.issg.org/database/).
Eurasian ruffe 	*Gymnocephalus cernuus* (Linnaeus, 1758)	Europe and Asia from France to eastern Siberia.	Some lakes in Europe, Great Lakes (U.S. and Canada). In the United States it has been found also in the waters of Indiana, Lake Michigan, Huron and Superior as well as many of their tributaries.	It competes aggressively with other native fish for food and space, and also can eat their eggs, resulting in a decline in their populations.	Nonindigenous Aquatic Species (NAS) information resource for the United States Geological Survey - USGS (http://nas.er.usgs.gov/). The Global Invasive Species Database - GISD (http://www.issg.org/database/). Picture source: Gary Cholwek.
Amur goby 	*Rhinogobius brunneus* (Temminck & Schlegel, 1845)	East Asia: Japan, Russian Far East, Taiwan, Korea, China and the Philippines.	United States (Washington State - Columbia River and East Fork Lewis River, Portland, Oregon - Ramsey Wetland), Karametniyaz, Turkmenistan.	Unknown.	Nonindigenous Aquatic Species (NAS) information resource for the United States Geological Survey - USGS (http://nas.er.usgs.gov/). Froese, R. and D. Pauly. Editors. 2007.FishBase. World Wide Web electronic publication. www.fishbase.org, version (09/2007). Picture source: Kim, Ik-Soo, at FishBase Website (www.fishbase.org/).

Common name and Pictures	Scientific Name	Origin	Countries with occurrence registers.	Impacts	References
Round goby 	*Neogobius melanostomus* (Pallas, 1814)	Azerbaijan, Armenia, Asia, Bulgaria Georgia, Islamic Republic of Iran, Kazakhstan, Romania Russian Federation, Serbia Montenegro, Turkey, Turkmenistan, Ukraine, and Uzbekistan.	Found in the United States (Illinois, Iowa, Michigan, Minnesota, New York, Ohio, Pennsylvania, Wisconsin); Canada (Ontario and Quebec); Belarus; Great Lakes; in the Austrian section of the Danube, in the vicinity of Vienna and Krems; in Poland was found in the Gulf of Gdansk, Vistula Lagoon and Vistula River.	Can compete for space and food with commercial native species, affecting their success in reproduction and probably causing decline and possible elimination of their stocks.	The Global Invasive Species Database - GISD (http://www.issg.org/database/). FishBase Website (http://www.fishbase.org/). Picture source: Otel, Vasile, at FishBase Website (www.fishbase.org/).
Comb jellyfish 	*Mnemiopsis leidyi* (Agassiz, 1865)	Temperate-to-subtropical estuaries along the Atlantic Coast of North and South America.	Black, Azov, and Caspian Seas.	After its introduction in the new habitats, it quickly reproduced and spread, praying on the zooplankton and consequently changing the food chain. It contributed significantly to the collapse of the fishing stocks of the Black Sea and Azov Sea in the nineties. In the Caspian Sea it caused the same effect collapsing the stocks of kilka fish, causing serious environmental, economic, and social impacts.	The Global Invasive Species Database - GISD (http://www.issg.org/database/). IMO and BBC. Invaders from the Sea. Mikhail G. Karpinsky, Tamara A. Shiganova and Damir N. Katunin. Introduced Species. Hdb Env Chem Vol. 5, Part P (2005): 175–190 Springer-Verlag Berlin Heidelberg 2005. Picture source: GISD (http://www.issg.org/database/).
Soft coral 	*Stereonephthya aff. curvata* (Kükenthal, 1910)	Indo-Pacific.	In Brazil: Lakes region and Ilha Grande Bay in the State of Rio de Janeiro.	Can potentially affect organisms that fix their selves on solid or unconsolidated substrata. Can cause lesions in other organisms due to metabolic substance it used as a defensive chemical against generalist fish or as an allelopathic agent against competitors.	IBAMA, GEO Brasil 2002, *op cit*. Bruno G. Lages *et al*, Chemical defense of na exotic coral as invasion strategy. Journal of Experimental Marine Biology and Ecology, Volume 328, Issue 1, p. 127-135, 2006. Picture source: Eduardo André A. de Souza.

Common name and Pictures	Scientific Name	Origin	Countries with occurrence registers.	Impacts	References
Toxic Algae  	*Gymnodinium catenatum* (Graham, 1943)	It is widely distributed, from the Mediterranean Sea to the Caribbean, Indian Ocean, and Australian waters.	Found in waters around Western Europe including the Mediterranean, West Africa, the Indian Ocean, South-East Asia, China, Japan, Southern to South-eastern Australia, New Zealand, West Coast of the U.S., Caribbean, and the South Atlantic off Southern Brazil.	Can form harmful algae blooms that can cause oxygen depletion and/or the release of toxins and other substances in the environment. This can impact negatively the marine life, coastal tourism, aquaculture shellfish industries, and even provoke severe illness or death for humans that eat seafood contaminated with paralytic shellfish toxins (PSP).	IMO and BBC. Invaders from the Sea. The Global Invasive Species Database - GISD (http://www.issg.org/database/). Fernando Gómez, The toxic dinoflagellate Gymnodinium catenatum: an invader in the Mediterranean Sea. Acta Bot. Croat. 62 (2), p. 65–72, 2003. Picture source: Fernando Gómez (Colony form) and B. Dale (Cyst form).
Cholera 	*Vibrio cholerae* (Pacini, 1854)	Various strains with broad ranges.	Is causing epidemic cholera in parts of Latin America, Africa, and Asia. In the U.S. it is sometimes present and has been found in the Chesapeake Bay and Great Lakes. Possibly introduced through ballast water. In Brazil, at least one outbreak of cholera in the port city of Paranaguá in 1999 was attributed to ballast water discharges.	Causes cholera, a potentially epidemic and life-threatening secretory diarrhea characterized numerous, voluminous watery stools, often accompanied by vomiting, and resulting in hypovolemic shock and acidosis. In its extreme manifestation, cholera is one of the most rapidly fatal illnesses known. Untreated cholera frequently results in high (50-60%) mortality rates.	IMO Website (http://www.imo.org/Environment/mainframe.asp?topic_id=548). The Global Invasive Species Database - GISD (http://www.issg.org/database/). IMO, Harmful Aquatic Organisms in Ballast Water: Investigation carried out in selected ports in Brazil to identify and characterize pathogens in ballast water. Submitted by Brazil. MEPC 48th Session, Agenda item 2, 2002. IMO, Harmful Aquatic Organisms in Ballast Water: Proposal for the standardization of indicators for assessment of the microbiological quality of ballast water. Submitted by Brazil. MEPC 49th Session, Agenda item 2, 2003. Picture source: Federal University of Santa Catarina.

Common name and Pictures	Scientific Name	Origin	Countries with occurrence registers.	Impacts	References
Pacific Sea Star 	*Asterias amurensis* (Lutken, 1871)	North Pacific waters and areas surrounding Japan, Russia, North China, and Korea.	Southern coasts of Australia including Tasmania and Victoria.	It is an aggressive predator that eats mainly mussels, scallops, and clams. Therefore it impacts both natural stocks of these organisms and aquaculture facilities, demanding high investments in control programs.	The Global Invasive Species Database - GISD (http://www.issg.org/database/). Picture source: GloBallast Programme (http://globallast.imo.org/).
The table shows introductions that not always occur exclusively through ballast water. Other factors such as currents, vessel hull, and aquariums could also be responsible for their introductions and spreading.					

Annex 2. Ballast Water Reporting Form adopted in 1997 by IMO Resolution A.868(20)

BALLAST WATER REPORTING FORM

(TO BE PROVIDED TO PORT STATE AUTHORITY UPON REQUEST)

1. VESSEL INFORMATION

Vessel Name:	Type:	IMO Number:	**2. BALLAST WATER**
Owner:	GT:	Call Sign:	Specify units: m^3, MT, LT, ST
Flag:	Arrival Date:	Agent:	Total Ballast Water on Board:
Last Port and Country:		Arrival Port:	Total Ballast Water Capacity:
Next Port and Country:			

3. BALLAST WATER TANKS

BALLAST WATER MANAGEMENT PLAN ON BOARD? YES ____ NO ____ HAS THIS BEEN IMPLEMENTED? YES NO

TOTAL NO. OF TANKS ON BOARD_____ NO. OF TANKS IN BALLAST_____ **IF NONE IN BALLAST GO TO NO. 5.**

NO. OF TANKS EXCHANGED_____ NO. OF TANKS NOT EXCHANGED_____

4. BALLAST WATER HISTORY: RECORD ALL TANKS THAT WILL BE DEBALLASTED IN PORT STATE OF ARRIVAL; IF NONE GO TO NO. 5.

Tanks/Holds (List multiple sources/tank separately)	BW SOURCE				BW EXCHANGE (circle one: Empty/Refill or Flow Through)					BW DISCHARGE			
	DATE DDMMYY	PORT or LAT. LONG.	VOLUME (units)	TEMP (units)	DATE DDMMYY	ENDPOINT LAT. LONG.	VOLUME (units)	% Exch.	SEA Hgt. (m)	DATE DDMMYY	PORT or LAT. LONG.	VOLUME (units)	SALINITY (units)

Ballast Water Tank Codes: Forepeak=FP, Aftpeak=AP, Double Bottom=DB, Wing=WT, Topside=TS, Cargo Hold=CH, O=Other

IF EXCHANGES WERE NOT CONDUCTED, STATE OTHER CONTROL ACTION(S) TAKEN:_____

IF NONE, STATE REASON WHY NOT._____

5. IMO BALLAST WATER GUIDELINES ON BOARD (RES. A 20/868)? YES ____ NO ____

RESPONSIBLE OFFICER'S NAME AND TITLE (PRINTED) AND SIGNATURE_____

Annex 3. Ballast Water Reporting Form adopted in 2000 by NORMAM-08 in Brazil

ANEXO 3-A

FORMULÁRIO PARA INFORMAÇÕES RELATIVAS À ÁGUA UTILIZADA COMO LASTRO
(A SER FORNECIDO PARA AUTORIDADE DO ESTADO DO PORTO QUANDO SOLICITADO)
BALLAST WATER REPORTING FORM
(TO BE PROVIDED TO PORT STATE AUTHORITY UPON REQUEST)

1. INFORMAÇÕES RELATIVAS AO NAVIO
VESSEL INFORMATION

Nome do Navio: Vessel Name	Tipo: Type	Nº da IMO: IMO Number	Especificar as Unidades: m^3, TM, L, ST: Specity Units m3. MT. LT. ST
Proprietário: Owner	TPB: GT	Indicativo de Chamada: Call Sign	Total de Água de Lastro a Bordo: Total Ballast Water on Board
Bandeira: Flag	Data de Chegada: Arrival Date	Agente: Agent	
Ultimo Porto e País: Last Port and Country		Porto de Chegada: Arrival Port	Capacidade Total de Água de Llastro: Total Ballast Water Capacity
Próximo Porto e País: Next Port and Country			

2. ÁGUA UTILIZADA COMO LASTRO
BALLAST WATER

3. TANQUES DE ÁGUA DE LASTRO
BALLAST WATER TANKS

EXISTE PLANO DE GERENCIAMENTO DE ÁGUA DE LASTRO A BORDO? SIM _____ NÃO _____ FOI IMPLEMENTADO?
BALLAST WATER MANAGEMENT PLAN ON BORD? YES NO HAS THIS BEEN IMPLEMENTED?

Nº TOTAL DE TANQUES A BORDO _____ Nº DE TANQUES EM LASTRO _____ SE NENHUM EM LASTRO, PASSE PARA Nº 5 SIM _____ NÃO _____
TOTAL NO. OF TANKS ON BOARD NO. OF TANKS IN BALLAST IF NOME IN BALLAST GO TO NO. 5 YES NO

Nº DE TANQUES SUBSTITUÍDOS _____ Nº DE TANQUES NÃO SUBSTITUÍDOS _____
NO. OF TANKS EXCHANGED NO. OF TANKS NOT EXCHANGED

4. HISTORICO DA ÁGUA DE LASTRO: LANÇAR TODOS OS TANQUES QUE FORAM DESLASTRADOS NO PORTO DE CHEGADA DO ESTADO DO PORTO – SE NENHUM, PASSE PARA O Nº 5
BALLAST WATER HISTORY: RECORD ALL TANKS THAT WILL BE DEBALLASTED IN PORT STATE OF ARRIVAL: IF NOME GO TO NO. 5

Tanques/Porões (Liste separadamente as diversas fontes/tanques) Tanks/Holds (List multiple sources/tank separately)	FONTE DE ÁGUA DE LASTRO BW SOURCE				SUBSTITUIÇÃO DA AGUA DE LASTRO Marque uma com um circulo: Vazio/Cheio Novamente ou Fluxo Contínuo BW EXCHANGE Circle one: Empty/Refill or Flow Through					DESCARGA DA ÁGUA DE LASTRO BW DISCHARGE			
	DATA DDMMAA DATE DDMMYY	PORTO ou LAT. LONG. PORT or LAT. LONG.	VOLUME (unidades) VOLUME (units)	TEMP (unidades) TEMP (units)	DATA DDMMAA DATE DDMMYY	PONTO FINAL LAT. LONG. END POINT LAT. LONG.	VOLUME (unidade) VOLUME (units)	% Subst. % Exch	MAR Alt. (m) SEA Hgt. (m)	DATA DDMMAA DATE DDMMYY	PORTO ou LAT. LONG. PORT or LAT. LONG	VOLUME (unidades) VOLUME (units)	SALINID (unidades) SALINITY (units)

Código para tanques de Água de Lastro: Tanque de Colisão AV = FP, Tanque de Colisão AR = AP, Duplo Fundo = DB, Lateral = WT, Lateral Sup. = TS, Porão = CH, Outros = O
Ballast Water Tank Codes: Forepeak = FP, Aftpeak = AP, Double Bottom = DB, Wing = WT, Topside = TS, Cargo Hold = CH, Other = O

SE NÃO TIVEREM SIDO FEITAS SUBSTITUIÇÕES, INDICAR OUTRA(S) AÇÃO(ÕES) DE CONTROLE EFETUADA(S): _____
IF EXCHANGES WERE NOT CONDUCTED, STATE OTHER CONTROL ACTION(S) TAKEN

SE NÃO TIVER SIDO EFETUADA NENHUMA, INDICAR PORQUE NÃO: _____
IF NOME STATE REASON WHY NOT

5. EXISTEM AS DIRETRIZES DA IMO SOBRE ÁGUA DE LASTRO A BORDO (RES. A. 868(20))? SIM _____ NÃO _____
IMO BALLAST WATER GUIDELINES ON BOARD (RES. A. 868(20))? YES NO

NOME E POSTO DO OFICIAL RESPONSÁVEL (LETRA DE IMPRENSA) E ASSINATURA _____
RESPONSIBLE OFFICER'S NAME AND TITLE (PRINTED) AND SIGNATURE

Annex 4. Ballast Water Reporting Form adopted in 2001 by Resolution RDC no 217 in Brazil

Agência Nacional de Vigilância Sanitária
Portos, Aeroportos e Fronteiras

MINISTÉRIO DA SAUDE

Formulário para Informações Sobre a Água de Lastro – Ballast Water Report

1. Identificação do Navio – Vessel Identification

Nome do Navio – Vessel Name:	Tipo – Type:	Nº de IMO – IMO number
Proprietário – Owner:	TPB – GT:	Indicativo de Chamada – Call Sign:
Bandeira – Flag:	Data de Chegada – Arrival Date:	Agente – Agent:
Ultimo Porto e País – Last Port and Country:	Porto de Chegada – Arrival Port:	
Próximo Porto e País – Next Port and Country:		

2. Água como Lastro – Ballast Water

Especificar Unidades: m3, TM, LT, ST : Specify Units: m3, TM, LT, ST:	Total de água de lastro a bordo : Total Ballast water on board:	Capacidade total de água de lastro a bordo : Total Ballast Water Capacity:

3- Tanques de água de lastro – Ballast water tanks

Existe Plano de Gerenciamento de Água de Lastro a a Bordo – Ballast Water Management Plan on Board? Sim/ Yes ☐ Não/ No ☐	Foi implementado – Management Plan Implemented? Sim/ Yes ☐ Não/ No ☐	
Nº total de tanques a bordo – Total nº of tanks on board:	Nº de tanques em lastro – nº of tanks in ballast:	Se nenhum , passe para o Nº 5 – If none go to nº 5.
Nº de tanques com troca de água – Nº of tanks exchanged:	Nº de tanques sem troca de água – Nº of tanks not exchanged:	

4. Histórico de água de lastro: registrar todos os tanques que serão deslastrados no porto de chegada. Se nenhum, passe para o nº 5
Ballast water history: record all tanks that will be deballasted in port state of arrival. If none, go to nº 5

Tanques ou Porões (listar separadamente as diversas fontes/tanques) Tanks / Holds (list multiple sources/ tank separately)	Fonte de água de lastro Ballast water source				Substituição de água de lastro/Ballast water exchange ☐ Vazio-Empty/ Cheio novamente – Refill ☐ Fluxo contínuo – Flow Through					Descarga de água de lastro / Ballast water discharge			
	Data dd/mm/aa Date dd/mm/yy	Porto ou lat/long Port or lat/long	Volume (unidades) Volume (units)	Temp (unidades) Temp (units)	Data dd/mm/aa Date dd/mm/yy	Ponto final ou lat/long End point or lat/long	Volume (unidades) Volume (units)	% de água trocada % Exchange	Onda alt. (m) Sea Hgt. (m)	Data dd/mm/aa Date dd/mm/yy	Porto ou lat/long Port or lat/long	Volume (unidades) Volume (units)	Salinidade (unidades) Salinity (units)

Códigos para tanques de água de lastro: Tanque de colisão AV = FP; Tanque de colisão AR = AP; Duplo fundo = DB; Lateral = WT; Lateral superior = TS; Porão = CH; Outros = O
Ballast water tanks codes: Forepak = FP; Aftpeak = AP; Double Bottom = DB; Wing = WT; Topside = TS; Cargo Hold = CH; Other = O

Se não houver troca de água de lastro, indicar outra(s) ação(ões) de controle efetuada(s) – If exchanges were not conducted, state other control action(s) taken

Se não houver sido efetuada nenhuma, indicar porque não – If none, state reason why not:

5. Existe a bordo publicação da IMO sobre água de lastro (Res. A868(20)? /IMO ballast water guidelines on board (Res. A868(20)? Sim/ Yes ☐ Não/ No ☐

Nome e posto do oficial responsável (letra de imprensa)
Responsible officer's name and title (printed)

Assinatura
Signature

Data do preenchimento
Fill in date

Annex 5. Ballast Water Reporting Form adopted in 2005 by NORMAM-20 in Brazil

NORMAM-20/DPC

ANEXO B

BALLAST WATER REPORTING FORM

1. SHIP INFORMATION

			2. BALLAST WATER
Vessel Name:	Type:	IMO Number:	Specify Units: M^3, MT
Owner:	Gross Tonnage:	Call Sign:	Total Ballast Water on Board:
Flag:	Arrival Date:	Agent:	
Last Port and Country:		Arrival Port:	Total Ballast Water Capacity:
Next Port and Country:			

3. BALLAST WATER TANKS Ballast Water Management Plan on board? YES _____ NO _____ Management Plan Implemented? YES NO

Total number of ballast tanks on board: _____ No. of tanks in ballast: _____ IF NONE IN BALLAST GO TO No. 5.

No. of tanks exchanged: _____ No. of tanks not exchanged: _____

4. BALLAST WATER HISTORY: RECORD ALL TANKS THAT WILL BE DEBALLASTED IN PORT STATE OF ARRIVAL; IF NONE GO TO No. 5.

Tanks/ Holds (List multiple sources per tank separately)	BALLAST WATER SOURCE					BALLAST WATER EXCHANGE Dilution (1), Flow Through (2) or Empty/Refill (3)						BALLAST WATER DISCHARGE			
	DATE DDMMYY	Port or Lat/Long *	Volume (units)	Temp (units)	Salinity (units)	DATE DDMMYY	Endpoint Lat/Long.	Volume (units)	% Exch	Depth (m)	BW exchange method	DATE DDMMYY	Port or Lat/Long *	Volume (units)	Salinity (units)

Ballast Water Tank Codes: Forepeak = FP, Aftpeak = AP; Double Bottom = DB; Wing = WT; Topside = TS; Cargo Hold = CH; Other = O

IF EXCHANGES WERE NOT CONDUCTED, STATE OTHER CONTROL ACTION(S) TAKEN:_____

IF NONE STATE REASON WHY NOT:_____

5: INTERNATIONAL CONVENTION FOR THE CONTROL AND MANAGEMENT OF SHIPS' BALLAST WATER AND SEDIMENTS, 2004 ON BOARD? YES_____ NO_____

IMO BALLAST WATER GUIDELINES ON BOARD (RES. A.868(20))? YES_____ NO_____

RESPONSIBLE OFFICER'S NAME AND TITLE (PRINTED) AND SIGNATURE: _____

*Fulfil with Port's name, preferably.