“Prohibition of pollution of marine environments: challenges and prospects”

AUTHORS	Kola O. Odeku Bapela M. Paulos

ARTICLE INFO	Kola O. Odeku and Bapela M. Paulos (2017). Prohibition of pollution of marine environments: challenges and prospects. *Environmental Economics*, *8*(3), 127-136. doi:10.21511/ee.08(3-1).2017.05
DOI	http://dx.doi.org/10.21511/ee.08(3-1).2017.05
RELEASED ON	Thursday, 19 October 2017
RECEIVED ON	Monday, 04 September 2017
ACCEPTED ON	Wednesday, 04 October 2017

LICENSE	This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License

JOURNAL	"Environmental Economics"
ISSN PRINT	1998-6041
ISSN ONLINE	1998-605X
PUBLISHER	LLC “Consulting Publishing Company “Business Perspectives”
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
48	0	0

© The author(s) 2024. This publication is an open access article.

Kola O. Odeku (South Africa), Bapela M. Paulos (South Africa)

Prohibition of pollution of marine environments: challenges and prospects

Abstract

This article examines how marine pollution can be effectively contained and curtailed using existing regulatory instruments. The harmful effect of marine pollution on marine ecosystems and species is a problem that needs to be addressed as a matter of urgency. It is against the backdrop of this concern that national and international legal frameworks have been put in place to regulate, reduce or stop marine pollution. Despite this, the problem of marine pollution is still rampant and impacting negatively on marine socio-economic goods and services. It is pertinent to point out that marine pollution only receives attention when it has catastrophic impacts. This article scrutinizes frameworks that have been put in place to curb marine polution by assessing their functions. It submits that measures should be taken to ensure compliance of these regulations and that prevention of marine pollution should be prioritized in order to guard against the manifestation of destructive adverse effects of harmful substances.

Keywords: marine pollution, marine resources, escalation, prevention, harmful substances, ecosystems, regulations.
JEL Classification: Q57.
Received on: 4th of September, 2017.
Accepted on: 4th of October, 2017.

Introduction

Undoubtedly, marine pollution is problematic and its impacts are having devastating and destructive effects on marine resources and the ecosystems (Sindermann, 2005). According to Vikas and Dwarakish (2015), the World Health Organization defines marine pollution 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 such 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". It is generally accepted that human factor plays a major role in the pollution of the marine and its environments. Grant and Ross (2002) elaborately described marine pollution and related issues thus "the world estuaries and oceans are the ultimate repository for a vast array of substances discharged deliberately or accidentally via human activities". Most of the harmful substances such as toxic effluent and chemicals that cause marine pollution are released to the oceans and seas by different role players particularly the industry and shipping companies (Islam & Tanaka, 2004). Generally, the source of these effluents and toxic chemicals are usually from different human activities which occur daily such as mining, dumping, oil spills and leakages (Grant & Ross, 2002). With regard to the impacts and effects of these harmful discharges into the marine environments, Grant and Ross (2002) indicate that "the immediate and most acute impacts of these activities occur in the coastal zone where population growth has increased dramatically over the years. Concomitant with growth have been conspicuous changes at the land-sea interface associated with construction of industrial installations, maintenance of harbors and other waterways, domestic development of the coastline, demands of tourism, and other uses of coastal zone is clearly at greater risk from various anthropogenic impacts. The open ocean is also not immune to pollution, for example, the impute of toxic chemicals from atmospheric transport and deposition, as well as from shipping operations beyond the chemicals shelf can adversely affect open ocean waters. Inputs from atmospheric fallouts alone can be delineated in all components of marine environment-seawater, sediments and biotas". These activities are harmful because "in the seas, the marine life faces threats in many ways, such as overexploitation and harvesting, deposit of waste, contamination, exotic species, soil recovery, dredging and global climate change" (Vikas & Dwarakish, 2015).

In South Africa, the earliest reference to marine pollution was in 1811, when harmful substances were discharged into the sea, contaminating the water (Dzombak et al., 2005). This act of marine pollution continued unabated with impunity until the government and the regulatory authorities stood up against it by promulgating laws prohibiting marine pollution.

© Kola O. Odeku, Bapela M. Paulos, 2017.
Kola O. Odeku, LL.D., Professor, Faculty of Management and Law, University of Limpopo, Turfloop, South Africa.
Bapela M. Paulos, Faculty of Management and Law, University of Limpopo, Turfloop, South Africa.

This is an Open Access article, distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International license, which permits re-use, distribution, and reproduction, provided the materials aren't used for commercial purposes and the original work is properly cited.

It is pertinent to mention that marine pollution is one of the major concerns of the international community and it has continue to intervene in this regard (Boyle, 1985). Reporting on the prohibition of marine pollution, Boyle (1985) asserts that the "conclusion of the International Convention for the Prevention of Pollution of the Sea by Oil marked the international community's first serious attempt to cope with the increasing scale of marine pollution". However, it was surprising that even when international community introduced the Convention for the Prevention of Pollution of the Sea by Oil, instead of the marine pollution to be contained and curtailed, shockingly, marine pollution from oil spillages increased at a faster rate. This was attributed to the reality that the "pollution of the seas by oil, chemicals, nuclear waste and the effluent of urban industrial society has continued to grow and cause ever more serious damage to the living resources and ecology of the marine environment and to the shores of coastal states (Boyle, 1985). According to Hughes et al. (2005), "resource managers and scientists from disparate disciplines are rising to the challenge of understanding and moderating human impacts on marine ecosystems". In the same vein, industries and the government are also concerned about the increase in the impact and effect of marine pollution on marine resources and ecosystems (Hughes et al., 2005). Boyle (1985) also asserts that "the control, reduction and elimination of marine pollution has become one of the major issues in the contemporary law of the sea and it has proven to be a complex task, requiring the creation of a new and growing body of international law". It is also important to point out that even though there is a general emergence of environmental consciousness in the world, the pace of the protection of the marine environments has been slow. As a result, pollution by polluters with impunity resulting in the death of marine animals and the destruction of marine ecosystems has not been abated (Stern, 2004).

Hazardous marine pollutants can either be mostly visible or invisible in the oceans and seas. However, a common characteristic is that they cause irreparable damage to marine resources, ecosystems and marine lives, especially if it occurs in economically and environmentally sensitive areas of the globe (Hassan, 2006; Qudah, 2014).

1. Methodology

The research methodology utilized in this article was a non-empirical qualitative approach based on an extensive review of relevant literature, consequent upon which gaps in the literature were filled and new knowledge produced. The scholarly resources include, but are not limited to legal lexicons of different dimensions, reports, legislation, regulations, charters, policies, academic journals, government gazette and various international and municipal instruments that have been enacted to discourage marine pollution and punish polluters.

2. Theoretical perspectives

Marine pollution is a major concern worldwide. It will take concerted efforts and strong will of the government of the worldwide to ensure that it is out rightly curbed by ensuring that all instruments prohibiting marine pollution are effectively and efficiently implemented and enforced (Yanagi, 1988). More importantly, awareness and education are also very important to reducing the pollution. This is because many people pollute the oceans and seas without knowledge of the adverse and harmful effects of their actions. Due to the escalating rate of marine pollution, it is important to have scholarly works focusing on the analysis of the laws regulating and prohibiting marine pollution as such works are limited and lacking in clarity (Jingjing, 2006).

In order to better understand the concept of marine pollution, it is necessary to define it. According to Glossary of Environment Statistics, Studies in Methods, Series F, No. 67, United Nations, New York, (1997), marine pollution is defined as "a direct or indirect introduction by humans of substances or energy into the marine environment resulting in harm to living resources, hazards to human health, hindrances to marine activities including fishing, impairment of the quality of sea water and reduction of amenities". This definition specifies different pathways as rivers, estuaries, coastal establishments, and outfall structures from which effluent and dumping of garbage can reach the coastal and marine environment (Parranom, 2010). The main impacts associated with marine pollution are as follows: (i) social impact: this is apparent on beaches where the water and its environment become dirty due to marine pollution, exposing tourists to diseases and putting their lives at risk (Sindermann, 2006); (ii) economic impact: an example may be drawn from the impact on production of sea food which contributes a certain portion to the growth of the economy. If marine pollution adversely affects marine life, the production of sea food will be low and the economy will suffer a blow (Bernal, P. et al., 2016); (iii) ecological impacts: occurs where marine ecosystem and habitat becomes degraded marine animals and plants suffer extinction; reproduction process of marine animals disturbed and marine animals and plants could become extinct (Pararanom, 2010).

In 1950, the most horrific mercury poisoning disaster the world had ever seen took place in Minamata, Japan. A tanker, which is one of the biggest tankers in the world, ran aground between land's end and the Isles of Scilly, leaking more than 100,000 tonnes of crude oil into the sea and causing major environmental damage and contamination of more than 20,000 sea birds (Tsuda et al., 2009). The incident triggered interest of the international community in the danger of marine pollution (Schachter & Serwer, 1971), and thereafter created overwhelming awareness on the devastating impacts and effects of marine pollution. It is however very worrying that after this incident and despite the grave lessons the pollution provided, Japanese society went on to experience a second occurrence of Minamata disease in the mid-1960s, in Niigata Prefecture. The history of the two incidences shows a lack of environmental governance in Japanese society. However, the awareness gained momentum all over the world and rational countries started to learn lessons and took a very firm stand against marine pollution by introducing strong laws to regulate and control marine pollution.

Similarly, in the 1967s, a vessel from Liberia caused marine pollution popularly known as the Torrey Canyon by discharging 120,000 tons of oil spills into the sea (Schiffman, 2001). This occurrence reinforced and motivated the whole world to provide a very strong leadership against marine pollution. To this end, various regulatory legal frameworks were promulgated nationally and internationally in order to prohibit, deter or mitigate marine pollution (Schiffman, 2001). Despite this, marine pollution continues to be an issue of great concern in the world and it continued to occur on a daily basis.

The Torrey Canyon made environmental preservation become more imperative (Schiffman, 2001). In the 1970s, there was general consciousness on the part of the international community to regulate marine pollution and manage ocean resources. This led to the promulgation of the Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft (1972, the OSLO Convention). The main aim of OSLO is to provide "for the control of dumping harmful substances from ships and aircrafts into the ocean and further made a restriction by requiring a permit in order to dump certain substances such as arsenic, lead, copper, zinc and their compounds".

In 1973, the Convention for the Prevention of Pollution from Ships (MARPOL) was introduced. It is pertinent to point out that both the OSLO and MARPOL Conventions are amended as new pollution events unfold in order to meet contemporary pollution challenges and problems. MARPOL "covers pollution by oil, chemicals, harmful packaged forms, sewage and garbage". The Convention for the Prevention of marine pollution from land base sources replaced the OSLO Convention in 1974.

In the early 1980s, the United Nation Convention on the Law of the Sea 1982 was enacted and "defined the rights and responsibilities of nations with respect to their use of the world's ocean, establishing the guidelines for businesses, the environment and the management of marine natural resources". In 1992, the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) Convention was entered into and it is the current legislative instrument regulating International Corporation on environmental protection on land based sources of marine pollution. More importantly, the first Ministerial Meeting of the OSPAR Commission in Sintra, Portugal in 1998 adopted Annex V to the Convention, to extend the cooperation of the Contracting Parties to cover all human activities that might adversely affect the marine environment of the North-East Atlantic.

In South Africa, there are various laws regulating marine pollution. Chapter VI of the South African Regulations under the Prevention and Combating of Pollution of the Sea By Oil Act 59 of 1984 "set out steps to combat or prevent marine pollution by oil and states that upon a discharge of oil from an offshore installation having been reported to a principal officer, the master or the owner of such offshore installation shall, unless such principal officer directs otherwise, take such steps as may be described in the contingency plan referred to in regulation 22(f) in order to combat the pollution or to prevent pollution by any further such discharge of oil". Marine Pollution (Prevention of Pollution from Ships) Act No. 2 of 1986 purpose is to provide for the protection of the sea from pollution by oil and other harmful substances discharged from ships, and for that purpose to give effect to the International Convention for the Prevention of Pollution from Ships, 1973, as amended by the Protocol of 1978; and to provide for matters connected therewith".

The schedule in terms of Prevention of Pollution by Garbage From Ships Regulations 1992 applies to South African ships wherever they may be, and to small vessels and ships while they are within the Republic of South Africa, the territorial waters thereof and the fishing zone and that if any person fails to comply with any of the requirements of these regulations such person shall be guilty of an offence and shall be punishable on conviction with a

fine not exceeding R20,000.00 or imprisonment for a period not exceeding two years or with both such fine and such imprisonment". Both international and municipal laws have been introduced specifically to regulate and prohibit marine pollution of all kinds (Hey, 1991). The purpose of this is to ensure that the marine lives and the water itself are protected by preventing dumping of harmful and hazardous substances either deliberately or incidentally into the seas or oceans through human activities (Sage-Fuller, 2013).

This article seeks to show that there are compelling reasons to protect the marine from pollution (Roberts & Hawkins, 2000). It also discusses the legislation governing marine pollution in South Africa and their importance in reducing marine pollution, if effectively implemented (Pantzar, 2014). It is worthy to mention that marine pollution distresses ocean economy and could have socio-economic impacts and setbacks (Lee, 2011) on the marine environments and resources. Against the backdrop of the need to safeguard and protect the oceans and seas from devastating impacts of marine pollution (De Fontaubert et al., 1996), there is need to intensify and strengthen the implementation and enforcement of laws and policies regulating marine pollution (Tan, 2005).

3. Sources and causes of marine pollution

In the words of Islam and Tanaka (2004), "overall, coastal and marine environmental degradation not only continues but has intensified. There have, however, been significant changes in perspective, and new concerns have emerged. Marine and coastal degradation is caused by increasing pressure on both terrestrial and marine natural resources, and on the use of the oceans to deposit wastes. Population growth and increasing urbanization, industrialization and tourism in coastal areas are root causes of this increased pressure". For example, fertilizers, pesticides and agrochemicals from agricultural activities "are reported to contribute about 50% of the total pollution source of surface water by means of the higher nutrient enrichment, mainly ammonium ion (NH4) and NO3 derived from agricultural inputs" (Islam & Tanaka, 2004).

There are different ways in which marine pollution can occur such as land-based activities, oil spills,pollution from sea-bed activities, noise pollution, and pollution from or through the atmosphere, and vessel source pollution (Vikas & Dwarakish, 2015). However, the most common types of marine pollution are discussed below.

3.1. Domestic and municipal wastes. It has been observed that "domestic and municipal wastes and sewage sludge are "by far the greatest volume of waste discharged to the marine environment. Sewage effluent contains industrial waste, municipal wastes, animal remains and slaughterhouse wastes, water and wastes from domestic baths, utensils and washing machines, kitchen wastes, faecal matter and many others. Huge loads of such wastes are generated daily from highly populated cities and are washed out by the drainage systems which generally open into nearby rivers or aquatic systems. As, the industrial areas are mostly highly populated or are usually established near highly populated areas. Higher pollution load from industrial sources is generally accompanied by a higher risk of domestic and sewage pollution" (Islam & Tanaka, 2004) Vikas and Dwarakish (2015) pointed out that "although it is hard to imagine raw sewage being dumped into the ocean, it happens on a regular basis. The oceans are vast and can break down this vile liquid, but it still causes many adverse effects on marine life. Sewage or polluting substances flow through sewage, rivers, or drainages directly into the ocean. This is often how minerals and substances from mining camps find their way into the ocean. The release of other chemical nutrients into the ocean's ecosystem leads to reduction in oxygen levels, the decay of plant life and a severe decline in the quality of the sea water itself. As a result, all levels of oceanic life, plants and animals, are highly affected".

3.2. Oil pollution. According to Islam and Tanaka (2004), "oil pollution has been receiving increasing attention since the middle of the 19th century with the increase in tanker operations and oil use and frequent marine tanker collisions and accidents resulting in oil spills. Millions of tons of oils are being added into the coastal and marine". According to Islam and Tanaka (2004) it should be pointed out that oil cannot dissolve in water and forms a thick sludge in the water. This suffocates fish, gets caught in the feathers of marine birds stopping them from flying and blocks light to photosynthetic aquatic plants". There have also been notable "heavy metals and trace elements which are by-products of many industrial processes, contributing varying amounts of different metals and trace elements and as such are discharged as waste into the marine environment" (Islam & Tanaka, 2004). Vikas and Dwarakishb (2015) indicated that "the principal cause of marine pollution with oil is shipping. Traditionally shipping is considered to be "a polluting industry. Ocean is polluted by oil on a daily basis from oil spills, routine shipping, runoffs and dumping. Oil spills make up about 12% of the

oil that enters the ocean. The rest come from shipping travel, drains and dumping. An oil spill from a tanker is a severe problem because there is such a huge quantity of oil being spilt at once".

According to Vikas and Dwarakishb (2015), "usual shipping operations, especially transportation of oil by tankers and accidents, result in the dumping of around 600000-1750000 tons of oil into the ocean per year". Also, oorganic compounds "many synthetic organic chemicals (e.g., organochlorines, organophosphates, PAHs and organometals) are of growing environmental concern, because of their high toxicity and high persistence in the environment and in biological systems" (Islam & Tanaka, 2004). More importantly, "plastics contribute the most significant part of marine litter deposits and solid wastes dumped into aquatic environments.

3.3. Plastic particles. A study done on a 1033 birds collected off the coast of North Carolina in the USA found that 55% of the bird species recorded had plastic particles in their guts" (Vikas & Dwarakishb, 2015). Most times, these birds eat "minute particles floating in the ocean because they resemble their natural food" (Vikas & Dwarakishb, 2015). According to Islam (2004), citing Blight and Burger (1997), "where they examined 58 species under three categories of marine birds, they reported that 100% of surface-feeding procellariforms, 75% of the shearwaters and 39% of the purcuit-diving acids contained plastics in their guts".

Plastics are dumped in huge volumes in well-used beaches, lakes, navigation channels and other forms of water masses (Islam & Tanaka, 2004). It has also been observed that "global estimates of erosion and sediment transport in major rivers of the world vary widely, reflecting the difficulty in obtaining reliable values for sediment concentration and discharge in many countries. It has been estimated that global sediment load to oceans in the mid-20th century to be 20,000 million tons per year, of which about 30% comes from rivers of Southern Asia" (Islam & Tanaka, 2004). With regard to plastic debris pollutant, plastic are primarily synthetic organic polymers derived from petroleum. Dumping of plastic in the marine environment is harmful and as such is illegal, because plastic materials are found to be the major macroscopic pollutants. Plastic materials are "one of the major kinds of human impact constituting a major threat to marine life: the pollution by plastic debris" (Vikas & Dwarakishb, 2015). According to the findings of Gregory and Ryan, "plastics are the predominant amongst the marine litter, and its proportion consistently varies between 60% and 80% of the total marine debris (Gregory & Ryan, 1997).

3.4. Non-point sources. A remarkable source which is very harmful and problematic is the Non-point source.Vikas and Dwarakishb (2015) citing National Oceanic and Atmospheric Administration (NOAA) asserted that "80% of pollution to the marine environment comes from the land. One of the biggest sources is called non-point source pollution, which occurs as a result of runoff. Non-point source pollution includes many small sources, like septic tanks, cars, trucks, and boats, plus larger sources, such as farms, ranches, and forest areas. Millions of motor vehicle engines drop small amounts of oil each day onto roads and parking lots. Much of this, too, makes its way to the sea when it rains. Some water pollution actually starts as air pollution, which settles into waterways and oceans. Dirt can be a pollutant. Non-point source pollution can make river and ocean water unsafe for humans and wildlife. In some areas, this pollution is so bad that it causes beaches to be closed after rainstorms. Correcting the harmful effects of non-point source pollution is costly". Huge money is being spent to ensure that areas damaged by the non-source are being protected and restored with the collaboration and the assistance of several agencies to develop ways to control nonpoint source pollution. These agencies engage in monitoring, assessment and containment in limiting non-point source pollution that may result naturally and by human actions.

4. Problem statement

Marine pollution is a worldwide problem and a major concern to everybody (Sheavly & Register, 2007). Despite the promulgation of regulatory frameworks nationally and internationally on the prohibition of marine pollution (Kennish, 1996), the problem of marine pollution continues to escalate on a daily basis all over the world (Krages, 2000). Most of the legal frameworks on marine pollution have set out numerous punishments for non-compliance (Tan, 2005), however, implementation and enforcement are very poor, hence, the pollution continues with impunity (Heimert, 1997). It is pertinent to point out that there could be no justification for deliberate or inadvertent marine pollution by anybody or entity (Anthony, 2006). All acts of marine pollution should be heavily sanctioned whenever they occur or perpetrated.

5. Discussion

Before the Minamata incident, there was no strong regulatory framework in place to combat marine pollution caisingto irreparable damages to the marine environments (Duruigbo, 2000). The Minamata pollution incidence was the eye opener which woke the international community from their slumber to collectively agreed that there was an urgent need to regulate and manage marine pollution.

5.1. Legislative intervention for prevention of marine pollution. The rule of law, respect for human rights and a free and independent judiciary are essential for protecting and enforcing environmental protection regimes (Hassan, 2007). Contemporary environmental law and the growing concern for the "condition of the oceans have given rise to a number of legal regimes addressing problems of the marine environment including pollution, loss of biodiversity, protection of endangered species, and marine mammals". Various international instruments on regulation of the marine environments have been the critical foundation for the various domestic laws prohibiting marine pollution. It has been pointed out that "the future of marine conservation, however, depends upon the ability and willingness of states to cooperate in these common objectives and the capacity of individual State to prescribe and enforce their own marine conservation laws" (Hassan, 2007). It is against the backdrop of prohibiting all acts of marine pollution that South Africa has supported all international instruments prohibiting marine pollution and has also, at the national level, promulgated various laws to prohibit marine pollution. This is because the "outmoded ideas that the oceans were somehow bottomless dumping grounds with limitless assimilative capacity and a ceaseless ability to surrender their resources have been replaced with a new, and more scientifically oriented, awareness of the oceans' environmental and ecological health" (Hassan, 2007). These days, marine environments and their protection are "indeed focal points of this recent and growing environmental consciousness. The environmental degradation of the oceans is by definition a global problem. Overfishing, vessel and land-based pollution, unsustainable and environmentally unfriendly exploitation of mineral resources, as well as the destruction of marine biodiversity are the concerns of all humanity" (Hassan, 2007).

More importantly, there are many benefits human beings derived from the marine and its environments. They "contribute to our food, medicines, energy, transportation, commerce, defense, and even recreation". It is against the backdrop of these benefits that there should be concerted efforts not to degrade the environments. There have been various legislative interventions and controls that have been introduced to ensure prohibition of all harmful substances in the marine environments. These instruments will help countries utilize the marine environments responsibly (Hassan, 2007).

5.1.1. The Constitution of the Republic of South Africa. The Constitution of the Republic of South Africa, 1996 is the supreme law and all laws derive their validity from the Constitution. Even laws and policies that were in place before the promulgation of the Constitution are currently valid based on the saving provisions in the Constitution which saved and validated all laws before South Africa became a constitutional democracy. Remarkably, the Constitution recognizes and makes ample provisions for the prevention of environmental pollution including marine pollution (Boyd, 2011). The Constitution also places obligation on the government to ensure that the environment is protected from being harmed or degraded in whatever manner or form. The protection of the environment falls within the ambit of fundamental rights. The issues relating to environment protection and fundamental rights are contained in section 24(a) of the Bill of Rights in the Constitution which provides that "everyone has the right to an environment that is not harmful to their health or well-being." Therefore, everyone has the right to be protected against any discharge of harmful substance or substances in whatever form be it to the marine, marine environments, the atmosphere and so on. Individuals and the state have the responsibility to protect the environment, hence individuals and states can be held liable in terms of section 24 of the Constitution for making the environment harmful to the health or well-being of other people.

5.1.2. Marine Pollution Act 6 of 1981 (MPA). The key purpose of the MPA is "to provide for the protection of the marine environment from pollution by oil and other harmful substances, and for that purpose to provide for the prevention and combating of pollution of the sea by oil and other harmful substances; to determine liability in certain respects for loss or damage caused by the discharge of oil from ships, tankers and offshore installations; and to provide for matters connected therewith".

This is the main Act in South Africa which regulates pollution from ships, tankers and offshore installations (Vrancken, 2011). More importantly,

appropriate sanctions for discharge of harmful substances are enshrined in the Act and states that "discharge of any oil from a ship, tanker or offshore installation within 12 miles of the South African coast is an offence".

5.1.3. The Marine Pollution (Prevention of Pollution from Ships) Act 2 of 1986 (MPPS). The purpose of the MMPS is to "provide for the protection of the sea from pollution by oil and other harmful substances discharged from ships, and for that purpose to give effect to the International Convention for the Prevention of Pollution from Ships".

The main contribution of this Act is that it is the primary instrument of setting marine minimum standards and measures of policing the design, building and operation of tankers. In terms of Section 2(1) of MMPS, "if any oil is discharged from a ship, tanker or offshore installation the master of such ship, tanker or offshore installation and, if he is not the owner of such ship, tanker or offshore installation, also the owner thereof, shall be guilty of an offence".

The Act applies the MARPOL 1973/78, which means the convention contained in the Schedule to the Marine Pollution (Prevention of Pollution from Ships) Act 2 of 1986; "to any South African ship, wherever it may be, and to any ship found within the Republic or its territorial waters or exclusive economic zone and section 3 of the MARPOL provides that non-compliance therewith is a criminal act, subject to a fine of R500 000 or a prison sentence of five years".

5.1.4. Marine Pollution (Intervention) Act 64 of 1987 (MPIA). The main purpose of MPIA is to "give effect to the International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, and to the Protocol Relating to Intervention on the High Seas in Cases of Marine Pollution by Substances Other than Oil 1973; and to provide for matters incidental thereto". Article I of MPIA provides that "parties to the present Convention may take such measures on the high seas as may be necessary to prevent, mitigate or eliminate grave and imminent danger to their coastline or related interests from pollution or threat of pollution of the sea by oil, following upon a maritime casualty or acts related to such a casualty, which may reasonably be expected to result in major harmful consequences".

The initiative behind MPIA is to "confer the powers given to a state party in terms of the international convention upon SAMSA in order to intervene in instances of potential spillage and to circumvent such spillage by a tanker. The Act further confers jurisdiction upon the court in whose area a person charged with contravening this act is found. The court in which such proceedings will be brought is a Magistrate court, which will impose the penalties provided for in the Act".

5.1.5. Marine Pollution (Control and Civil Liability) Act 6 of 1981 (MPCCL). This Act has two purposes, firstly, "to provide for the prevention and combating of pollution of the sea by oil and other harmful substances and to determine liability in certain respects for loss or damage caused by oil pollution incidents". Secondly, in terms of liability, it provides for both criminal and civil liability. With regard to criminal provisions, the Act provides in ssection 2(1) "that if any oil is discharged from a ship, tanker or offshore installation, the master of the ship and its owner shall be guilty of an offence". The effect of this is to impute strict liability on both the master and the owner.

5.1.6. National Environmental Management Act 62 of 2008 (NEMA). NEMA requires that management of the marine should comply with the principles of co-operative environmental governance as set out in the Act. And generally, the purpose of NEMA is to "provide for co-operative environmental governance by establishing principles fordecision-making on matters affecting the environment, institutions that will promote cooperative governance and procedures for co-ordinating environmental functions exercised by organs of state; to provide for certain aspects of the administration and enforcement of other environmental management laws; and to provide for matters connected therewith". Marine pollution activities needs to be regulated and managed in accordance with the principles contained in section 2 of NEMA. The NEMA makes provision for "all three fields of environmental concern, namely: resource conservation and exploitation; pollution control and waste management and development". Therefore, in terms of section 4(a)(ii) NEMA admonished "that pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimized and remedied". Failure to heed this warning will attract sanctions in sections 31N(3) which provides that "A person convicted of an offence in terms of subsection (1) is liable to a fine not exceeding five million rand or to imprisonment for a period notexceeding 10 years or to both such fine and such imprisonment".

5.1.7 National Environmental Management Waste Act 58 of 2009. The purpose of the Act is "to reform the law regulating waste management in order to protect health and the environment by providing

reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development; to provide for institutional arrangements and planning matters; to provide for national norms and standards for regulating the management of waste by all spheres of government; to provide for specific waste management measures; to provide for the licensing and control of waste management activities; and to provide for the remediation of contaminated land".

The Act in section 68(4) states that "a person who is convicted of an offence in terms of this Act and who persists after conviction in the act or omission that constituted the offence commits a continuing offence and is liable on conviction to a fine not exceeding R1 000 or to imprisonment for a period not exceeding 20 days, or to both such fine andsuch imprisonment, in respect of each day that person persists with that act or omission". This section is used to punish the perpetrators for non-compliance.

5.1.8. National Environmental Management: Integrated Coastal Management Act 24 of 2008. This Act establishes a system of integrated coastal and estuarine management in South Africa in order "to encourage the conservation of the coastal environment, sustain the natural attributes of coastal landscapes and seascapes, and ensure that development and the use of natural resources within the coastal zone is ecologically sustainable and socially and economically justifiable". It "prohibits incineration at sea and controls dumping at sea, pollution in the coastal zone, inappropriate development of the coastal environment and other adverse effects on the coastal environment and also gives effect to South Africa's international obligations in relation to coastal matters" (Van der Linde & Feris, 2010).

6. The application of pollution control principles on the prohibition of pollution of marine environments

The polluter pays principle stipulates that whoever pollutes the environment must pay for the damages that are caused as a result of their actions (Cordato, 2006). This principle however, is ineffective in as far as marine pollution is concerned because other pollution in the ocean has the capacity of causing irreparable harm. Payment alone is not an appropriate remedy, because often times, marine pollution causes the death of marine species and plants (Craig, 2005). Consequently, it is incumbent on the government to implement and enforce punitive sanctions on polluters, especially wealthy individuals and their companies (Short & Toffel, 2010). Payment of money alone will not be an adequate sanction (Pitt & Groskaufmanis, 1989) as, in most cases, they have the wherewithal and financial capacity to pay hence, they continue to pollute with impunity (Kraakman, 1984).

The precautionary principle is about being cautious and has the semblance of preventing the occurrence of marine pollution (Mart, 1979). To this end, this would discourage or make would-be polluters to refrain from conducting themselves in manners that have the potential of introducing or discharging harmful substances into the sea (Marr, 2003).

The preventive measure is the most important principle that is relevant in marine pollution regulation (De Sadeleer, 2002). It deters people from conducting themselves in manners which can cause marine pollution (Hahn & Richards, 1989). This principle follows the notion that prevention is always better than cure (Mensah, 2007). It might be important to note that the combination of all these measures would be most effective in curbing pollution.

Conclusion and recommendations

There are many international instruments and national legislation that have been put in place to address the problem of marine pollution. Despite this, the problem is still rampant in all coastal areas of the world. This is due to the business as usual attitudes of the polluters coupled with poor implementation and enforcement of laws prohibiting marine pollution by those who have the power to enforce. It is against this backdrop that this article advanced the argument for stringent applications and enforcements of all the regulatory interventions prohibiting marine pollution in order to protect marine resources, ecosystems and lives.

It is therefore recommended that for sustainable marine resources and wealth dumping of harmful substances in the oceans and seas should be deterred by using all available mechanisms to hold perpetrators accountable wherever they operate. However, it is pertinent to point out that the responsibility to prevent and prohibit marine pollution should not be left to the government alone; citizens must also take responsibility to combate marine pollution by participating in activities that will make the beaches and marine environments to be clean at all times.

Prevention should take a centre stage and be prioritised at all times. Education and public awareness campaigns on the adverse effects of marine pollution on human beings, sea lives and ecosystems are imperative, especially as preventive measures. To this end, education and awareness campaigns in combination with effectively implementation of marine pollution regulatory instruments could serve as useful tools that could be used to achieve a drastic reduction in dumping of harmful substances in the oceans and seas.

References

1. Anthony, O. G. (2006). Criminalization of seafarers for accidental discharge of oil: Is there justification in international law for criminal sanction for negligent or accidental pollution of the sea. *Journal of Maritime Law and Commerce, 37,* 219-229.
2. Blight, L. K., Burger, A. E. (1997). Occurrence of plastic particles inSeabirds from the Eastern North Pacific. *Marine Pollution Bulletin, 34*(5), 323-325.
3. Bocquené, G., Bellanger, C., Cadiou, Y., Galgani, F. (1995). Joint action of combinations of pollutants on the acetylcholinesterase activity of several marine species. *Ecotoxicology, 4*(4), 266-279.
4. Boyd, D. R. (2011). *The environmental rights revolution: a global study of constitutions, human rights, and the environment*. UBC Press, Vancouver, Toronto.
5. Cordato, R. E. (2006). *The Polluter Pays Principle: A Proper Guide for Environmental Policy*. Retrieved from https://scholar.google.co.za/scholar?hl=en&q=_sdt=1%2C5&as_sdtp= (accessed on April 29, 2017).
6. Craig, R. K. (2005). Protecting international marine biodiversity: international treaties and national systems of marine protected areas. *Journal of Land Use & Environmental Law, 20*(2), 333-369.
7. Crowder, L., Norse, E. (2008). Essential ecological insights for marine ecosystem-based management and marine spatial planning. *Marine Policy, 32*(5), 72-778.
8. Daoji, L., Daler, D. (2004). Ocean pollution from land-based sources: East China Sea, China. *AMBIO: A Journal of the Human Environment, 33*(1), 107-113.
9. De Fontaubert, A. C., Downes, D. R., Agardy, T. (1996). *Biodiversity in the seas: Implementing the convention on biological diversity in marine and coastal habitats.* Retrieved from http://www.ciel.org/wp-content/uploads/2015/07/BioSeas_IUCN_1996.pdf (accessed on April 29, 2017).
10. De Sadeleer, N. (2002). *Environmental principles: from political slogans to legal rules*. Oxford, UK: Oxford University Press.
11. Dzombak, D. A., Ghosh, R. S. Wong-Chong, G. M. (2005). *Cyanide in water and soil: chemistry, risk, and management*. USA, New York: Taylor & Francis.
12. Gregory, M. R., Ryan, P. G. (1997). Pelagic plastics and other seaborne persistent synthetic debris: a review of Southern Hemisphere perspectives. In Coe, J. M., Rogers, D. B. (Eds.), *Marine Debris – Sources, Impacts and Solutions* (pp. 49-66). New York: Springer-Verlag.
13. Hassan, D. (2006). *Protecting the marine environment from land-based sources of pollution: towards effective international cooperation*. USA, Burlington: Ashgate Publishing Company.
14. Hassan, P. (2007). Environmental Protection, Rule of Law and the Judicial Crisis in Pakistan. *Asia Pacific Journal of Environmental Law, 10,* 167-174.
15. Heimert, A. J. (1997). Keeping Pigs Out of Parlors: Using Nuisance Law to Affect the Location of Pollution. *Environmental Law, 27,* 403-412.
16. Hey, E. (1991). Precautionary Concept in Environmental Policy and Law: Institutionalizing Caution. *Georgetown International Environmental Law Review, 4,* 303-311.
17. Islam, M.S., Tanaka, M. (2004). Impacts of pollution on coastal and marine ecosystems including coastal and marine fisheries and approach for management: a review and synthesis. *Marine pollution bulletin, 48*(7-8), 624-649.
18. Kennish, M. J. (1996) *Practical handbook of estuarine and marine pollution.* Retrieved from https://books.google.co.za/books?hl=en&lr=&id=ug0vpM0iJOMC&oi=fnd&pg=PA1&dq= (accessed on June 16, 2017).
19. Kennish, M. J. (1997). *Pollution impacts on marine biotic communities*. USA, New York: CRC Press.
20, Kindt, J. W. (1984). Law of the Sea: Offshore Installations and Marine Pollution. *Pepperdine Law Review, 12,* 381-390.
20. Kraakman, R. H. (1984). Corporate liability strategies and the costs of legal controls. *Yale Law Journal, 93*(5), 857-898.
21. Krages, B. P. (2000). *Total Environmental Compliance: A Practical Guide for Environmental Professionals*. USA, New York: Lewis Publishers.
22. Krause, D. (1993). Environmental Consciousness An Empirical Study. *Environment and Behavior, 25*(1), 126-142.
23. Lee, H. (2011). *Impacts of oil spills: Ecological, human health and economic.* Retrieved from https://repositories.lib.utexas.edu/handle/2152/17526 (accessed on April 29, 2017).
24. Long, R. (2012). *Legal aspects of ecosystem-based marine management in Europe.* Retrieved from https://aran.library.nuigalway.ie/handle/10379/2917 (accessed on April 29, 2017).
25. Marr, S. (2003). *The precautionary principle in the law of the sea: modern decision making in international law*. Netherlands, Hague: Kluwer Law International.
26. Mart, L. (1979). Prevention of contamination and other accuracy risks in voltammetric trace metal analysis of natural waters. *Fresenius' Zeitschrift für analytische Chemie, 296*(5), 350-357.
27. Mensah, T. A. (2007). Prevention of marine pollution: the contribution of IMO. *Pollution of the Sea-Prevention and Compensation, 10,* 41-61.

28. Pantzar, M. (2014). *Towards Ecosystem-Based Protection of Marine Environments-Investigating the scope for marine reserves in Northern Europe under the Marine Strategy Framework Directive.* Retrieved from http://lup.lub.lu.se/student-papers/record/4696773
29. Parramon, M. (2010). *Theoretical framework pertaining to the regulation of Land Based Marine Pollution.* Retrieved from http://dspace.nwu.ac.za/bitstream/handle/10394/5229/Parramon_M_Chapter2.pdf?sequence=22 (accessed on May 16, 2017).
30. Pitt, H. L., Groskaufmanis, H. L. (1989). Minimizing corporate civil and criminal liability: A second look at corporate codes of conduct. *Georgetown Law Journal, 78,* 1559-1568.
31. Qudah, H. (2014). *Towards International Criminalization of Transboundry Environmental Crimes.* Retrieved from http://digitalcommons.pace.edu/lawdissertations/16/ (accessed on May 02, 2017).
32. Roberts, C. Hawkins, J. P. (2000). *Fully-protected marine reserves: a guide.* Retrieved from https://www.researchgate.net/publication/246263998_Fully-Protected_Marine_Reserves_A_Guide (accessed on May 02, 2017).
33. Sanchirico, J. N., Emerson, P. M. (2002). *Marine protected areas: economic and social implications.* Retrieved from www.spcsrp.org/en/marine-protected-areas-economic-and-social-implications (accessed on May 02, 2017).
34. Schachter, O., & Serwer, D. (1971). Marine Pollution Problems and Remedies. *The American Journal of International Law, 65*(1), 84-111.
35. Sheavly, S. B., Register, S. B. (2007). Marine debris & plastics: environmental concerns, sources, impacts and solutions. *Journal of Polymers and the Environment, 15*(4), 301-305.
36. Sinderman, C. J. (2006). *Coastal Pollution: Effects on Living Resources and Humans.* CRS press publishers.
37. Sindermann, C. J. (2005). *Coastal pollution: effects on living resources and humans*. Retrieved from https://www.crcpress.com/Coastal-Pollution-Effects-on-Living-Resources-and-Humans (accessed on July 16, 2017).
38. Soni, R. (1985). *Control of Marine Pollution in International Law*. Juta & Co. Ltd.
39. Stern, D. I. (2004). The Rise and Fall of the Environmental Kuznets Curve. *World Development, 32*(8), 1419-1439.
40. Sutinen, J. G., Olsen, S. B., Juda, L., Hennessey, T. M. (2006). *A handbook on governance and socioeconomics of large marine ecosystems.* Retrieved from http://scholar.google.co.za/scholar_url?url (accessed on May 02, 2017).
41. Tan, A. K .J. (2005). *Vessel-source marine pollution, the law and politics of international regulation*. USA, Cambridge: Cambridge University Press.
42. Tsuda, T., Yorifuji, T., Takao, S., Miyai, M. (2009). Minamata disease: catastrophic poisoning due to a failed public health response. *Journal of Public Health Policy, 30,* 54-67.
43. Van der Linde, M., Feris, L. (2010). *Compendium Of South African Environmental Legislation*. South Africa, Pretoria: University of Pretoria Law Press.
44. Vikas, M. A., Dwarakishb, G. S (2015). International conference on water resources, coastal and ocean engineering (ICWRCOE 2015). *Coastal Pollution: A Review, 4,* 381-388.
45. Vrancken, P. H. G. (2011). *South Africa and the Law of the Sea*. Martinus Nijhoff Publishers.
46. Yanagi, T. (1988). Preserving the inland sea. *Marine Pollution Bulletin, 19*(2), 51-53.
47. Yearley, S. (2014). *The Green Case (Routledge Revivals): A Sociology of Environmental Issues, Arguments and Politics*. USA, New York: Routeledge.